

# Series 100 Gas Analyzers

**BINOS® 100, BINOS® 100 M**

**BINOS® 100 2M, BINOS® 100 F**

**OXYNOS® 100, HYDROS® 100**



Software Version 5.1x

**ROSEMOUNT®**  
Analytical

# ESSENTIAL INSTRUCTIONS

## READ THIS PAGE BEFORE PROCEEDING!

Emerson Process Management (Rosemount Analytical) designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you **MUST properly install, use, and maintain them** to ensure they continue to operate within their normal specifications. The following instructions **MUST be adhered to** and integrated into your safety program when installing, using and maintaining Emerson Process Management (Rosemount Analytical) products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- **Read all instructions** prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, **contact your Emerson Process Management (Rosemount Analytical) representative** for clarification.
- **Follow all warnings, cautions, and instructions** marked on and supplied with the product.
- **Inform and educate your personnel in the proper installation, operation, and maintenance of the product.**
- **Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes.** Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, **use qualified personnel** to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Emerson Process Management (Rosemount Analytical). Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, **and VOID YOUR WARRANTY**. Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- **Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.**

The information contained in this document is subject to change without notice.

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**EMERSON**  
Process Management

## **Safety Summary**

### **I. Intended Use Statement**

The series 100 instruments are intended for use as an industrial measurement device only. It is not intended for use in medical, diagnostic, or life support applications, and no independent agency certifications or approvals are to be implied as covering such applications.

### **II. Safety Symbols**

Several symbols attached to the analyzer or printed in the instruction manual are used to point out special sources of danger:



**Source of danger !**  
See Operation Manual!



**Electrostatic Discharge (ESD) !**



**Explosives !**



**Hot components !**



**Toxic !**



**Risk to health !**



**Analyzer specific notes for the user !**

For additional information to these safety symbols see instruction manual.  
Strictly follow the related instructions !

**III. General**

- ◆ To avoid explosion, loss of life, personal injury and damages to this equipment and other property, all personnel authorized to install, operate and service this equipment should be thoroughly familiar with and strictly follow the instructions in this manual !  
Save these instructions !
- ◆ If this equipment is used in a manner not specified in these instructions, protective features may be impaired !
- ◆ Correct and safe operation of analyzers calls for appropriate transportation and storage, expert installation and commissioning as well as correct operation and meticulous maintenance !
- ◆ Emerson Process Management does not take responsibility (liability) for the customer's failure to comply with these requirements !
- ◆ Do not attempt internal service or adjustment unless other person, capable of rendering first aid and resuscitation, is present !
- ◆ Because of the danger of introducing additional hazards, do not perform any unauthorized modification to the instrument !  
Return the instrument to a Emerson Process Management Sales and Service office for service or repair to ensure that safety features are maintained !
- ◆ Instruments which appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.



Do not open instrument when energized !  
Component replacement and internal adjustments requires servicing by qualified personnel only !



Read this instruction manual before attempting to operate the instrument !  
Be sure to observe the additional notes, safety precautions and warnings given in the instruction manual !



Operate analyzer as table-top version or as rack-mountable version (built-in) only (except of BINOS® 100 F: designed for wall mounting only) !



Do not operate the instrument in the presence of flammable gases or explosive atmosphere without supplementary protective measures !



Hot components may exist at the photometer or in heated versions !

### **BINOS 100 F**



The analyzer has a weight of approx. 30 - 35 kg.  
Lift or carry this unit with at least 2 persons.  
For easy transport use a suitable cart or comparable tools.



Verify that the cable fittings with installed cables are hermetic to be in agreement with protection class IP 65 (according to DIN standard 40050).  
The permissible outside diameters of the cables are 7 to 12 mm !



The analyzer is intended to be wall mounted. Use bolts which are suitable for the weight of the unit and appropriate anchors.  
Make sure the wall where the analyzer is intended to be mounted is solid to hold the analyzer!

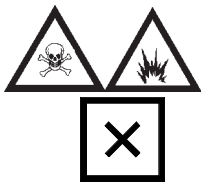
## IV. Gases and Gas Conditioning (Sample Handling)



Be sure to observe the safety regulations for the gases (sample gas and test gases / span gases) and the gas bottles !



Inflammable or explosive gas mixtures must not be purged into the instrument without supplementary protective measures !



To avoid risks for the operators by explosive, toxic or unhealthy gas components, first purge the gas lines with ambient air or nitrogen (N<sub>2</sub>) before cleaning or exchanging parts of the gas paths.

## V. Supply Voltage



The socket outlet shall be installed near the equipment and shall be easily accessible to disconnect the device from the socket outlet.



Verify whether the line voltage stated on the instrument or power supply is in accordance with that of your mains line!



Be sure to observe the safety precautions and warnings given by manufacturer of power supply !

- ◆ BINOS® 100(M), BINOS® 100 2M (external PS), HYDROS® 100 and OXYNOS® 100 are Safety Class III instruments.



Verify correct polarity for 24 V DC operation !



Use only power supply VSE 2000, UPS 01 T, DP 157, SL5, SL10 (DP 157 and SL for rack installation only) or equivalent power supplies to keep the instrument safe.



If using equivalent power supplies they must have SELV output voltage !

◆ BINOS® 100 2M (internal PS) and BINOS® 100 F are Safety Class 1 instruments



The analyzer is provided with a protective earth terminal.

To prevent shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the AC power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet.

If the instrument is to be energized via an external power supply, that goes for the power supply too.

Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. Deliberate disconnection is inadmissible / prohibited !



The analyzer BINOS® 100 F (field housing) has no switch with disconnect function. The customer has to provide a switch or circuit breaker into his installation. This switch has to be installed near by analyzer, must be easily attainable for operator and has to be characterized as disconnect for analyzer.



Cables to external data processing have to be double-insulated against mains voltage for analyzer BINOS® 100 F !

Use cables suitable for intrinsic safe applications only ! Install internal data lines that they have a distance to mains voltage lines of at least 5 mm.

This distance has to be valid permanently (e.g. via cable holder) !



24 VDC supply to external components/analyzers with the internal power supply of BINOS® 100 2M requires a fuse to be connected in series to the consumer which limits the current consumption to max. 2 A !



Verify correct polarity for 24 V DC supply of external components !

## VI. Analyzer specific notes for the user



The installation site for the instrument has to be **dry** and remain **above freezing point** at all times.

The instrument must be exposed neither to direct sunlight nor to strong sources of heat. Be sure to observe the permissible ambient temperature ! For outdoor sites, we recommend to install the instrument in a protective cabinet. At least the instrument has to be protected against rain (e.g., shelter).



Do not interchange gas inlets and gas outlets !

All gases have to be supplied to the analyzer as conditioned gases ! If corrosive gases are inserted into the instrument, it has to be verified that there are no gas components which may damage the gas path components.



Ensure that all gas connections are made as labeled and are leak free !

Improper gas connections could result in explosion and death !

The unit's exhaust may contain hydrocarbons and other toxic gases such as carbon monoxide ! Carbon monoxide is highly toxic !



Permissible gas pressure of sample gas / test gases max. 1,500 hPa !



The exhaust gas lines have to be mounted in a declining, descending, pressureless and frost-free and according to the valid emission legislation !



In case it is necessary to open the gas paths, close the analyzers gas connections with PVC caps immediately to avoid pollution of gas paths !



BINOS® 100 F lift points are labeled ! Labels showing down side for transport ! Do not use electronics of the optional pressurization system as handle !



Use only optional delivered cables from our factory or equivalent shielded cables to be in agreement with the CE conformity.

The customer has to prove that the shield is connected correctly (chapter 29.10). Shield and connectors housing have to be connected conductive. Sub. min. D plugs/sockets have to be screwed to the analyzer.



The analyzer (excepting BINOS® 100 F) is not in agreement with the CE conformity if optional terminal strip adapters are used In this case CE conformity must be declared by customer as "manufacturer of system".



## VII. BINOS® 100 F specific notes for use in hazardous areas (EX Zones)



Be sure to observe the additional notes, safety precautions and warnings given in the supplemental manual for analyzers intended to be used in hazardous areas.

If you do not have the additional manual available, please contact your Emerson Process Management Sales Office!

### VII.a Z purge for CSA-C/US Ex Zone 2 Non-Flammable Atmospheres



This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized !



Upon start-up or after loss of continuous dilution requiring switching off the electrical supply, purge for 11 minutes with flow rate approx. 55 scfh (26 l/min., see chapter 5.3.3) unless the internal atmosphere is known to be well below the lower explosive limit (LEL) !



This analyzer is not designed for analysis of flammable sample !

Introduction of flammable samples into this equipment could result in explosion, causing severe personal injury, death or property damage !

Consult factory if flammable samples are to be measured !



Do not open while energized unless it is known that no explosive atmosphere is present !

**VIII. Additional notes for service / maintenance**

Do not open instrument when energized !

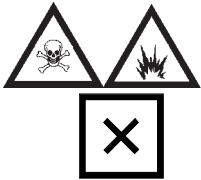
Component replacement and internal adjustments requires servicing by qualified personnel only !



Always disconnect power, discharge circuits and remove external voltage sources before troubleshooting, repair or replacement of component !



Any work inside the instrument without switching off the power must be performed by a specialist who is familiar with the related danger, only !



To avoid a danger to the operators by explosive, toxic or unhealthy gas components, first purge the gas lines with ambient air or nitrogen (N<sub>2</sub>) before the gas paths are cleaned or parts are replaced.



Hot components may exist at the photometer or in heated versions !



In case of replacing fuses the customer has to be certain that fuses of specified type and rated current are used. It is prohibited to use repaired fuses or defective fuse holders or to short-circuit fuse carriers (fire hazard).



Do not open BINOS® 100 F for use in hazardous areas (EX Zones) while energized unless it is known that no explosive atmosphere is present !



Cleaning of BINOS® 100 F front panel for EX Zone 1:

Danger of electrostatic discharge !

Use damp cloth only for cleaning front panel !

## VIII.a Electrostatic Discharge



The electronic parts of the analyzer can be irreparably damaged if exposed to **electrostatic discharge (ESD)**.

The instrument is ESD protected when the covers have been secured and safety precautions observed. When the housing is open, the internal components are not ESD protected anymore.

Although the electronic parts are reasonable safe to handle, you should be aware of the following considerations:

Best ESD example is when you walked across a carpet and then touched an electrical grounded metal doorknob. The tiny spark which has jumped is the result of electrostatic discharge (ESD).

You prevent ESD by doing the following:

Remove the charge from your body before opening the housing and maintain during work with opened housing, that no electrostatic charge can be built up.

Ideally you are opening the housing and working at an ESD protecting workstation. Here you can wear a wrist trap.

However, if you do not have such a workstation, be sure to do the following procedure exactly:

Discharge the electric charge from your body. Do this by touching a device that is grounded electrically (any device that has a three - prong plug is grounded electrically when it is plugged into a power receptacle).

This should be done several times during the operation with opened housing (especially after leaving the service site because the movement on a low conducting floors or in the air might cause additional ESDs).

## **IX. Operating Conditions according to DMT Approval**

(The following is a reprint of chapter 6 of the supplement I to the DMT reports "IBS/PFG-No. 41300392 NIII" and "IBS/PFG-No. 41300292 NIII" about the performance test of the stationary gas analyzers BINOS® 100 (M/2M) and OXYNOS® 100).

*According to the system version and measuring results included in this report, the stationary gas analyzers BINOS® 100 (M/2M) from Fisher-Rosemount GmbH & Co. [now: Emerson Process Management; the editor] are suitable for measuring the concentrations of methane between 0 and 80 % CH<sub>4</sub>, of carbon dioxide between 0 and 80 % CO<sub>2</sub>, of carbon monoxide between 0 - 200 ppm CO and 0 - 10 Vol.% CO and the stationary gas analyzers BINOS® 100 (M/2M) and OXYNOS® 100 are suitable for measuring of oxygen between 0 - 10 Vol.-%, if the features and system version go conform with the details contained in the enclosed documents as stated in this report, if the analysis system is operated accordingly and if the following requirements are met:*

- ◆ *When using the gas warning system, it must be ensured that the permissible variations will not be exceeded, taking into account the systematic failures of the measuring signals (as indicated in this report) and the local operating conditions. Consider the Code of Practice No. T032 of the Labor Association of the Chemical Industry "Usage of stationary gas warning systems for explosion protection".*
- ◆ *Verify that the explosion protection requirements are met when using the gas warning system.*
- ◆ *Depending on the situation, it must be verified that the preset values are low enough to allow the system to activate the necessary protection and emergency measures and, thus, to prevent any critical situations in a minimum period of time.*
- ◆ *When at system installation, a release of one or both measuring components in the ambient air might occur, its influence on the measuring result should be proved. A sealed cell or an external housing purging with sample-free air of measuring gases can be used, if required.*
- ◆ *The operability of the alarms and the displays of each system should be tested with clean air and test gas after the initial operation, after each long-time interruption, and periodically. The tightness of gas paths should also be tested. The tests must be documented by keeping accounts.*

- ◆ *The intervals for the periodical tests must be settled by the person being responsible for the system's security and in accordance with the Code of Practice No. T023 of the Labor Association of the Chemical Industry "Maintenance of stationary gas warning systems for explosion protection".*
- ◆ *Consider the superproportional dependency of the barometric pressure on the measured value for CO<sub>2</sub>.*
- ◆ *The system control with serial interfaces described in this operation manual have not been subject to this investigation.*
- ◆ *Sample gas condensation in analyzer (components) must be prevented by taking the necessary steps.*
- ◆ *When the system is used with aggressive gases, it is to be verified that there are no gas components which might damage the gas path components.*
- ◆ *Appropriate dust filters must precede the used systems.*
- ◆ *The pressure and flow values recommended by the manufacturer should be observed. An external monitoring of the sample gas flow through the analyzer should be provided.*
- ◆ *The results of this investigation are based on the systems using software versions "3.03", "4.00", "4.01" and "4.11". A change of the software version used must be certified by the Testing Association.*
- ◆ *It should be ensured that the system parameters for the analog output have been correctly adjusted. End of range of low concentration should not be identical or lower than the begin of range. Disregarding these versions, the measurement range should be adjusted between 0 to 80 % CH<sub>4</sub>, 0 to 80 % CO<sub>2</sub>, 0 to 10 % CO or 0 to 10 % O<sub>2</sub> resp. when the systems are used for explosion protection.*
- ◆ *Read and follow the operation and maintenance manual supplied to and certified by PFG. It is important that the temperature is kept between 5 and 45 °C.*

- ◆ *The analyzer housings must be provided with a permanent type plate indicating the name of the manufacturer, model number, serial number, and the following reference and date of testing:*

*"IBS/PFG-Nr. 41300392" (for CH<sub>4</sub>, CO<sub>2</sub> or CO)*

*"IBS/PFG-Nr. 41300292" (for O<sub>2</sub>)*

*Other designation requirements, such as these according to ElexV, are still valid. With this type plate, the manufacturer conforms that the features and technical data of the delivered system are identical with those described in this report. Any system which is not provided with such a type plate does not go conform with this report.*

- ◆ *The chapter 6 of this report must be included in the operation and maintenance manual.*
- ◆ *The manufacturer has to supply the customer with a copy of this report, if required.*
- ◆ *A print of the report in an abridged version requires the agreement of PFG.*
- ◆ *The results included in this report may not be altered in publications produced by the manufacturer.*







## PREFACE

### General Overview

The series 100 of analyzers offers multi-component, multi-method analysis. Different measurement methods can be combined in one analyzer. The following measuring methods of the individual measuring channels are possible:

IR	=	non-dispersive infrared measurement
PO <sub>2</sub>	=	paramagnetic oxygen measurement
EO <sub>2</sub>	=	electrochemical oxygen measurement
TC	=	thermal conductivity measurement

All analyzers are designed to measure 1 or 2 gas components except of HYDROS® 100 and OXYNOS® 100 in case of PO<sub>2</sub> measurement (both 1 channel only).

#### a) Software Versions

Different software versions and analyzer options are available:

**BINOS® 100 (M), OXYNOS® 100, HYDROS® 100 (1/4 19" housing, external power supply):**

Version 4.11 with optional RS 232/485 Interface (according to DMT Approval)

Version 5.10 with optional RS 232/485 Interface

**BINOS® 100 2M (1/2 19" housing, internal power supply):**

Version 4.11 with optional RS 232/485 Interface (according to DMT Approval)

Version 5.10 with optional RS 232/485 Interface<sup>\*)</sup>

**BINOS® 100 2M (1/2 19" housing, external power supply):**

Version 4.11 with optional RS 232/485 Interface (according to DMT Approval)

Version 5.10 with optional RS 232/485 Interface<sup>\*)</sup> and/or with optional 7 digital inputs

Version 5.11 with optional 7 digital inputs and FOUNDATION™ Fieldbus<sup>\*\*)</sup>

**BINOS® 100 F (field housing, internal power supply):**

Version 4.11 with optional RS 232/485 Interface (according to DMT Approval)

Version 5.10 with optional RS 232/485 Interface<sup>\*)</sup> and/or with optional 7 digital inputs

Version 5.11 with optional 7 digital inputs and optional FOUNDATION™ Fieldbus<sup>\*\*)</sup>

<sup>\*)</sup> not in combination with FOUNDATION™ Fieldbus

<sup>\*\*)</sup> not in combination with RS 232/485 interface

**b) Housing Versions**

Different housing versions are delivered (for detailed informations see price list):

BINOS® 100	= 1/4 19" housing, ext. PS	one or two IR channel
BINOS® 100 M	= 1/4 19" housing, ext. PS,	one IR channel and one EO <sub>2</sub> channel
BINOS® 100 2M	= 1/2 19" housing, internal or external PS,	one or two IR channel(s) or one IR channel and one EO <sub>2</sub> channel or one IR channel and one PO <sub>2</sub> channel or one IR channel and one TC channel or one PO <sub>2</sub> channel and one TC channel or one EO <sub>2</sub> channel and one TC channel or one or two PO <sub>2</sub> channels one or two EO <sub>2</sub> channels one or two TC channels
	with standard options:	one internal sample gas pump one internal solenoid valve block one integrated fine dust filter one integrated flow indicator
BINOS® 100 F	= field housing, int. PS, with standard options:	measuring channels see BINOS® 100 2M see BINOS® 100 2M (dust filter for GP only)
HYDROS® 100	= 1/4 19" housing, ext. PS,	one TC channel
OXYNOS® 100	= 1/4 19" housing, ext. PS,	one or two EO <sub>2</sub> channel or one PO <sub>2</sub> channel

## Area Classification

### a) General Purpose

All analyzer components are installed into a 1/4 19" housing (BINOS® 100 (M), OXYNOS® 100, HYDROS® 100) or a 1/2 19" enclosure (BINOS® 100 2M), 3 height units. These housings are go conform to DIN-standard protection class IP 20. The housings are available as rack-mountable or as table-top versions. The table-top housings are fitted with an additional carrying handle and additional rubber feets.

Additionally we can deliver a field housing version (BINOS® 100 F). All componets are installed into a protection housing conforming to DIN-standard protection class IP 65 (approx. NEMA 4/4X). This enclosure is designed for wall mounting.

### b) Hazardous Areas

For installation in hazardous areas special versions of BINOS® 100 F are avaiable with adapted options and specifications. These versions are not subject of this manual (except the variation with Z-purge). For all other analyzer versions intended to be used in hazardous areas pls. refer to the separate manuals.

#### Ex Zone 2

The BINOS® 100 F is equipped with

- Pressurization system for ATEX EX Zone 2 Applications
- Z purge for CSA-C/US EX Zone 2 Non-Flammable Atmospheres

#### Ex Zone 1

The BINOS® 100 F is equipped with

- Pressurization system for ATEX EX Zone 1 Applications



# Table of Contents

<b><u>SAFETY SUMMARY</u></b>	<b><u>S - 1</u></b>
I. Intended Use Statement	S - 1
II. Safety Symbols	S - 1
III. General	S - 2
V. Supply Voltage	S - 4
VI. Analyzer specific notes for the user	S - 6
VII. BINOS® 100 F specific notes for use in hazardous areas (EX Zones)	S - 7
VII.a Z purge for CSA-C/US Ex Zone 2 Non-Flammable Atmospheres	S - 7
VIII. Additional notes for service / maintenance	S - 8
VIIIa Electrostatic Discharge	S - 9
IX. Operating Conditions according to DMT Approval	S - 10
<b><u>PREFACE</u></b>	<b><u>P - 1</u></b>
<b>General Overview</b>	<b>P - 1</b>
a) Software Versions	P - 1
b) Housing Versions	P - 2
<b>Area Classification</b>	<b>P - 3</b>
a) General Purpose	P - 3
b) Hazardous Areas	P - 3
Ex Zone 2	P - 3
Ex Zone 1	P - 3
<b><u>1. TECHNICAL DESCRIPTION</u></b>	<b><u>1 - 1</u></b>
1.1 Front Panel	1 - 1
1.2 Rear Panel	1 - 5
1.3 Internal Construction	1 - 11
1.3.1 Internal Gas Paths	1 - 25
a) Gas Path Material	1 - 25
b) Gas Path Layout (internal tubing)	1 - 26

<b><u>2.</u></b>	<b><u>MEASURING PRINCIPLE</u></b>	<b><u>2 - 1</u></b>
2.1	IR Measurement	2 - 1
2.1.1	Interference Filter Correlation (IFC Principle)	2 - 1
2.1.2	Opto-Pneumatic Measuring Principle	2 - 3
2.1.3	Technique	2 - 5
2.2	Oxygen Measurement	2 - 6
2.2.1	Paramagnetic Measurement	2 - 6
2.2.2	Electrochemical Measurement	2 - 8
2.3	Thermal Conductivity Measurement	2 - 10
2.3.1	Sensor Design	2 - 10
2.3.2	Analysis Cell	2 - 10
2.3.3	Measurement Method	2 - 11
<b><u>3.</u></b>	<b><u>PHOTOMETER ASSEMBLY</u></b>	<b><u>3 - 1</u></b>
3.1	Photometer with Pyroelectrical Detector (Solid-state detector)	3 - 1
3.2	Photometer with Gas Detector	3 - 4
<b><u>5.</u></b>	<b><u>PREPARATION OF START-UP</u></b>	<b><u>5 - 1</u></b>
5.1	Installation Site	5 - 2
5.2	Gas Conditioning (Sample Handling)	5 - 3
5.2.1	Fine Dust Filter (Option BINOS® 100 2M/F)	5 - 4
5.2.2	Gas Sampling Pump (Option BINOS® 100 2M/F)	5 - 4
5.2.3	Pressure Sensor (Option)	5 - 4
5.2.4	Gas Flow	5 - 4
5.3	Gas Connections	5 - 5
5.3.1	Standard	5 - 5
5.3.2	Internal Solenoid Valves (Option BINOS® 100 2M/F)	5 - 8
5.3.3	Purge gas connection of BINOS® 100 F for Ex zones	5 - 10
5.4	Additional Hints to BINOS® 100 F (Field Housing)	5 - 11
5.4.1	Wall Mounting	5 - 12
5.4.2	Electrical Connections	5 - 13

<b>6.</b>	<b><u>SWITCHING ON</u></b>	<b><u>6 - 1</u></b>
6.1	General	6 - 1
6.2	24 V DC Supply	6 - 2
6.3	230/120 V AC Supply	6 - 2
6.3.1	BINOS® 100 2M	6 - 4
6.3.2	BINOS® 100 F	6 - 5
<b>7.</b>	<b><u>KEY FUNCTIONS</u></b>	<b><u>7 - 1</u></b>
7.1	FUNCTION	7 - 2
7.2	ENTER	7 - 4
7.3	INPUT - CONTROL	7 - 6
7.4	PUMP (BINOS® 100 2M/F only)	7 - 7
<b>8.</b>	<b><u>SETTING SYSTEM PARAMETERS</u></b>	<b><u>8 - 1</u></b>
8.1	Pressure Correction	8 - 2
8.2	Cross Compensation (internal)	8 - 2
8.3	Cross Compensation Calibration (internal)	8 - 3
8.4	Hold	8 - 4
8.5	Automatic Calibration	8 - 4
8.6	Tolerance Check	8 - 5
8.7	Display Off	8 - 6
8.8	Analog Signal Outputs	8 - 7
8.9	Flushing Period	8 - 8
8.10	User Code	8 - 8
8.11	Response Time (t90)	8 - 9
8.12	Offset (Begin of range)	8 - 10
8.13	End of Range Value	8 - 11
8.14	Reset	8 - 12
8.15	Program Version	8 - 13
8.16	Serial - No.	8 - 13
8.17	Pump *)	8 - 14
8.18	Pump Control *)	8 - 14

<b>9. CALIBRATION</b>	<b>9 - 1</b>
9.1 Manual Calibration	9 - 2
9.1.1 Zeroing	9 - 2
9.1.2 Spanning	9 - 4
9.2 Time-Controlled Calibration Mode (Option)	9 - 7
9.2.1 Zeroing	9 - 7
9.2.2 Combined Zeroing and Spanning	9 - 9
9.3 Remote-Controlled Calibration Mode (Option)	9 - 10
<b>10. MEASUREMENT / SWITCHING OFF</b>	<b>10 - 1</b>
10.1 Measurement	10 - 1
10.2 Switching Off	10 - 1
<b>11. DIGITAL OUTPUTS</b>	<b>11 - 1</b>
11.1 Concentration Limits	11 - 2
11.2 Valve Control	11 - 4
11.3 Status Signals (Option non-voltage-carrying relay contacts)	11 - 4
<b>12. SERIAL INTERFACE (OPTION)</b>	<b>12 - 1</b>
12.1 Upgrading Serial Interface / Status Signals	12 - 1
12.2 General	12 - 2
12.3 Start Up	12 - 4
12.3.1 RS 232 C	12 - 4
12.3.2 RS 485	12 - 5
12.3.3 Switching ON/OFF Interface Operation	12 - 6
12.3.4 Setting Interface Parameters	12 - 6
12.4 Telegram Syntax	12 - 8
12.4.1 Start Character ( "\$" = Hex 24)	12 - 8
12.4.2 Terminate Character ( "CR" = Hex OD)	12 - 8
12.4.3 Instruction Code	12 - 8
12.4.4 Hyphen Character ( ";" = Hex 3B)	12 - 8
12.4.5 Status Telegram	12 - 9
12.4.6 Numerical Representations	12 - 10
12.4.7 Block Parity Check	12 - 10
12.5 Instruction Syntax	12 - 11
12.5.1 Instruction Listing	12 - 12
12.5.2 Response Telegrams	12 - 13



<b><u>13. DIGITAL INPUTS / FOUNDATION™ FIELDBUS</u></b>	
<b><u>(BINOS® 100 2M/F OPTION ONLY)</u></b>	<b><u>13 - 1</u></b>
13.1 Digital Inputs	13 - 1
13.1.1 General	13 - 1
13.1.2 Start of Calibration	13 - 1
13.1.3 Valve Control	13 - 2
13.1.4 Pump Control	13 - 2
13.2 Foundation™ Fieldbus *)	13 - 2
<b><u>14. CROSS COMPENSATION / SETTING OF RESPONSE TIME</u></b>	
<b><u>(TC OPTION ONLY)</u></b>	<b><u>14 - 1</u></b>
14.1 Cross Compensation	14 - 1
14.1.1 Preparing Actions	14 - 2
14.1.2 Adjustment Procedure	14 - 3
<b><u>16. LIST OF FAILURES</u></b>	<b><u>16 - 1</u></b>
<b><u>17. MEASURING POINTS OF BKS AND OXS</u></b>	<b><u>17 - 1</u></b>
17.1 Measuring points of BKS	17 - 1
17.1.1 Supply Voltage + 6 V	17 - 1
17.1.2 Reference Voltage positive	17 - 1
17.1.4 Motor Drive (for IR channel only)	17 - 2
17.1.5 Temperature Sensor	17 - 3
17.1.6 Light Barrier Signal	17 - 4
17.1.7 Analog Preamplifiering	17 - 5
17.2 Measuring points of OXS (EO2 measurement)	17 - 6
17.2.1 Sensor Signal	17 - 6

<b><u>18. PLUG PIN ALLOCATION OF PRINTED CIRCUIT BOARDS</u></b>	<b><u>18 - 1</u></b>
18.1 Plug Pin Allocation of BKS	18 - 1
18.1.1 IR measurement without oxygen channel	18 - 2
18.1.2 Oxygen Measurement without IR channel	18 - 2
18.1.3 IR / Oxygen Measurement combined	18 - 3
18.1.4 TC Measurement without IR channel	18 - 3
18.1.5 IR / TC Measurement combined	18 - 4
18.1.6 Oxygen / TC Measurement combined	18 - 4
18.2 Plug Pin Allocation OXS (EO <sub>2</sub> measurement only)	18 - 5
18.3 Plug Pin Allocation WAP 100 (TC measurement only)	18 - 6
<b><u>19. JUMPER ALLOCATION OF BKS</u></b>	<b><u>19 - 1</u></b>
<b><u>21. FINE DUST FILTER (OPTION)</u></b>	<b><u>21 - 1</u></b>
<b><u>22. LEAK TESTING</u></b>	<b><u>22 - 1</u></b>
<b><u>23. HOUSING</u></b>	<b><u>23 - 1</u></b>
23.1 Cleaning of Housing Surface	23 - 1
23.2 Opening the Housing	23 - 2
23.2.1 1/4 19" Housing	23 - 2
23.2.2 BINOS® 100 2M	23 - 3
a) Housing Cover	23 - 3
b) Front Panel	23 - 4
23.2.3 BINOS® 100 F (Field Housing)	23 - 5
<b><u>24. REPLACEMENT AND CLEANING OF PHOTOMETRIC COMPONENTS</u></b>	<b><u>24 - 1</u></b>
24.1 Taking out the Photometer Assembly	24 - 1
24.2 Light Source Replacement	24 - 2
24.3 Cleaning of Analysis Cells and Windows	24 - 3
24.3.1 Removal of Analysis Cells	24 - 3
24.3.2 Cleaning	24 - 4
24.3.3 Reinstalling the Analysis Cells	24 - 5
24.4 Chopper Replacement	24 - 6
24.5 Reinstalling of the Photometer Assembly	24 - 6
24.6 Physical Zeroing	24 - 7
24.6.1 Standard Photometer (not sealed version)	24 - 7

24.6.2	Sealed Photometer (Option)	24 - 8
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## **25. CHECKING / REPLACING AN ELECTROCHEMICAL**

### **OXYGEN SENSOR** **25 - 1**

25.1	Checking the Sensor	25 - 2
25.2	Replacing the Sensor	25 - 3
25.2.1	Remove the old Sensor	25 - 3
a)	Oxygen Measurement without IR - channel	25 - 3
b)	IR / Oxygen Measurement combined	25 - 5
25.2.2	Removing the Sensor	25 - 6
25.2.3	Reinstalling the Sensor	25 - 6
a)	Oxygen Measurement without IR - channel	25 - 6
b)	Combined IR / Oxygen Measurement	25 - 6
25.2.4	Basic settings for the Oxygen Sensor	25 - 7

## **27. TECHNICAL DATA** **27 - 1**

27.1	Options	27 - 1
27.2	Housing	27 - 1
27.3	Signal Inputs / Outputs, Interfaces	27 - 2
27.4	General Specifications	27 - 3
27.5	Voltage Supply	27 - 9
27.5.1	Electrical Safety	27 - 9
27.5.2	Power Supplies [UPS 01 T / SL10 / SL5]	27 - 9

## **28. REPLACING THE EPROM** **28 - 1**

## **30. CABLES AND CORDS** **30 - 1**

30.1	24 V DC Supply Cable	30 - 1
30.2	230/120 V AC Input (BINOS® 100 2M, UPS power supply)	30 - 2
30.3	Power Supply for Wall Mounted Analyzers (BINOS® 100 F)	30 - 2
30.3	Data / Signal Lines	30 - 3
30.3.1	Sub D Sockets, 9 pin	30 - 3
30.3.2	Sub D Plugs, 9 pin	30 - 3

## **32. FAILURE CHECK LIST** **32 - 1**

a)	Customer Service	32 - 4
b)	Training	32 - 4







## 1. Technical Description

The different analyzers are based on the same internal main components and differ only by available options and enclosures.

### **BINOS® 100 (M), OXYNOS® 100, HYDROS® 100 (1/4 19" enclosures)**

### **BINOS® 100 2M (1/2 19" enclosure )**

All analyzer components are installed into enclosure, 3 height units tall. These housings are classified protection class IP 20. The housings are available as rack-mountable or as table-top versions. The table-top housings are fitted with an additional carrying handle and additional rubber feet.

### **BINOS® 100 F (field housing, wall mountable)**

Additional we can deliver a field housing version . All components are installed into a protective enclosure, classified IP 65 acc. IEC 60529 (approx. NEMA 4/4X). This enclosure is designed for wall mounting. An magnetically operated impact tested front panel is available as an option.

Special versions are available for installation in hazardous areas, which meet the requirements of either ATEX (Europe), CENELEC (outside Europe) or North America (CSA-C/US; Z-purge).

The special conditions for operating ATEX analyzers are described in a supplemental manual.

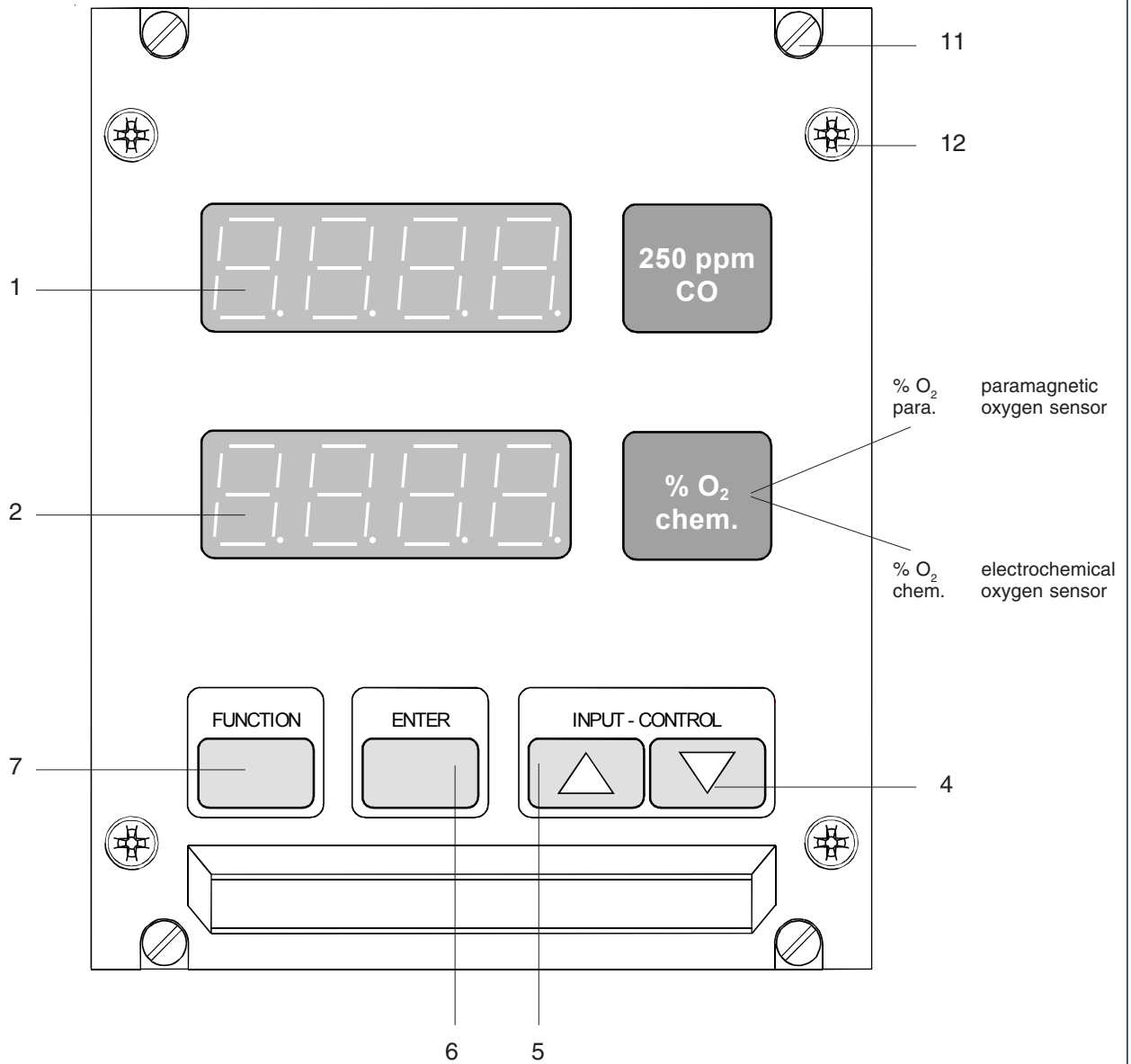
### 1.1 Front Panel

The front panel includes the LED displays for both analysis channels and all of the analyzer operating controls.

The BINOS® 100 2M and BINOS® 100 F front panels show status LEDs for the options “Solenoid Valves” and “Gas Sampling Pump” and include a key “PUMP” ) to switch on and off the gas sampling pump.

The front panels of BINOS® 100 2M and BINOS® 100 F may be equipped with an optional fine dust filter with integrated needle valve or/and a flow meter (for general purpose applications only).

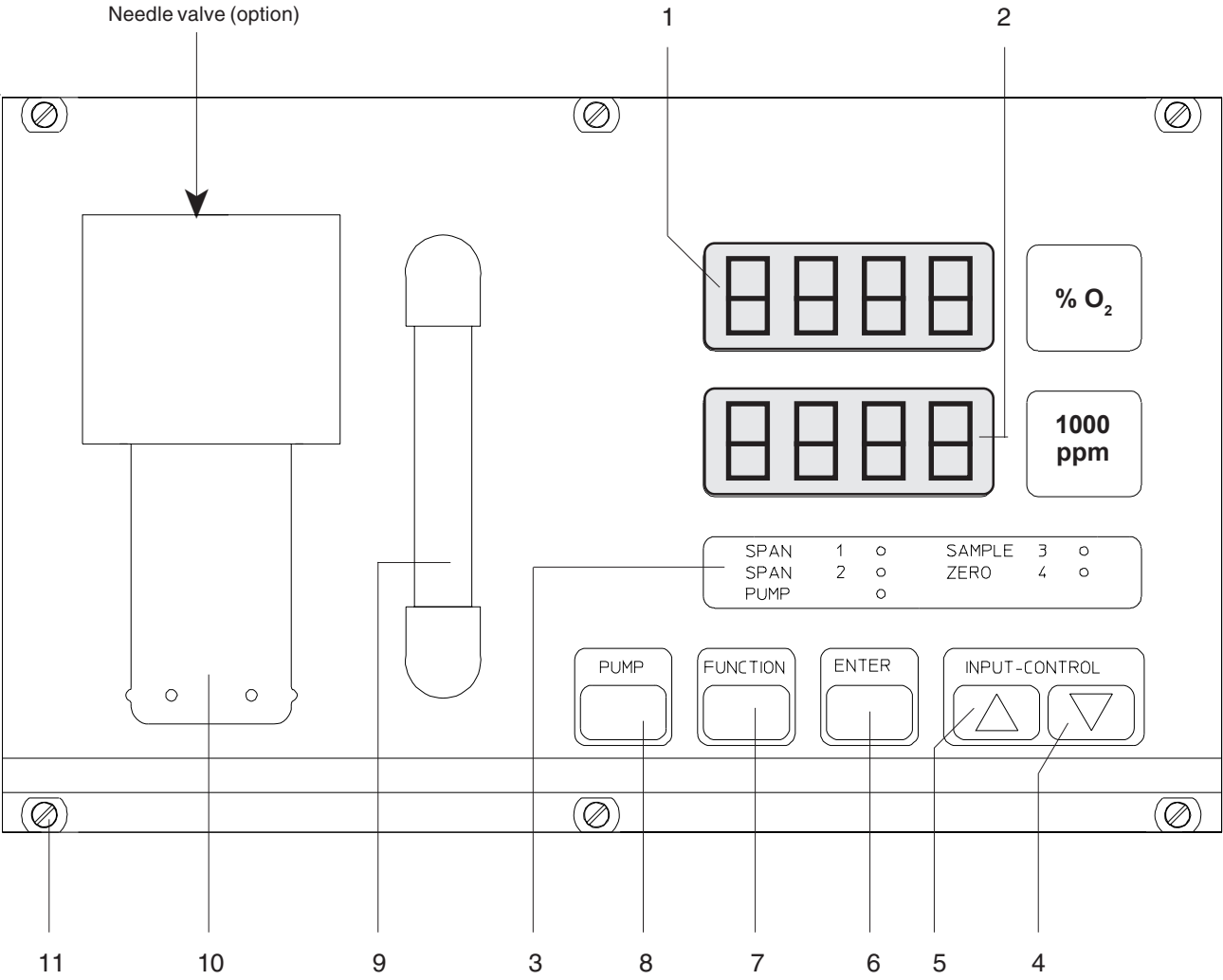
These options are not available if BINOS® 100 F is intended to be used in hazardous areas (EX Zones) or if IP 65 is required.



**Fig. 1-1: BINOS® 100 (M), OXYNOS® 100, HYDROS® 100 Front view**

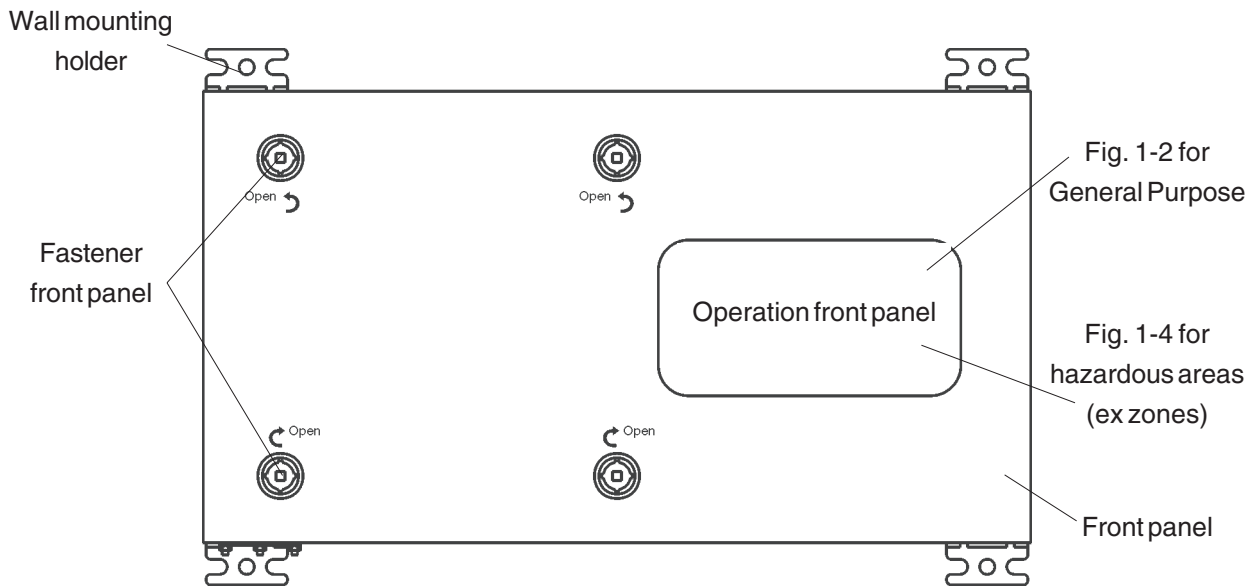
- 1 LED display (channel 1)
- 2 LED display (channel 2)
- 4 Input setting control key **DOWN**
- 5 Input setting control key **UP**
- 6 Key **ENTER**
- 7 Key **FUNCTION**
- 11 Fastening screws for the carrying-strap bracket or rack-mounting purposes
- 12 Housing cover fastening screw



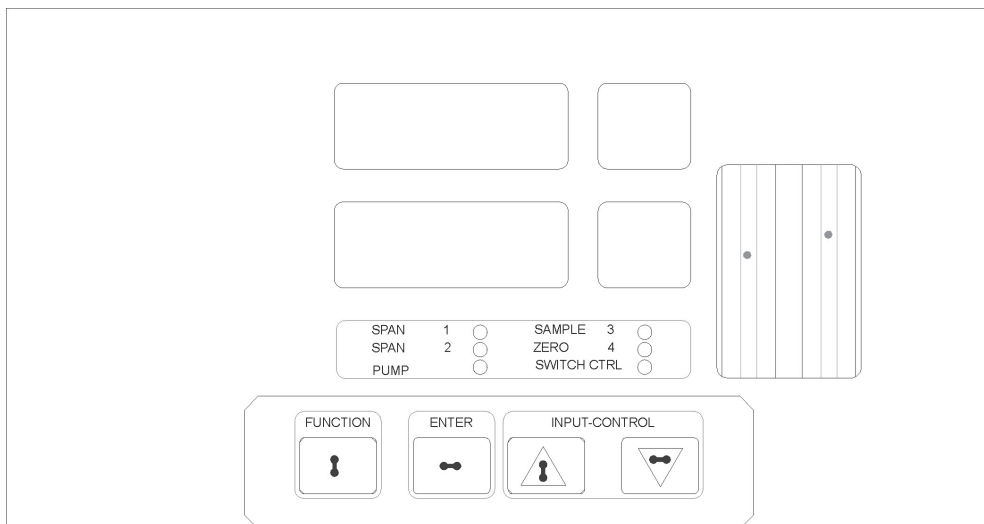


**Fig. 1-2: BINOS® 100 2M (standard version), front view**

- 1 LED display (channel 1)
- 2 LED display (channel 2)
- 3 Function LED for options "Solenoid Valves / Gas Sampling Pump"
- 4 Input setting control key **DOWN**
- 5 Input setting control key **UP**
- 6 **ENTER** key
- 7 **FUNCTION** key
- 8 Key for option "Gas Sampling Pump"
- 9 Flow indicator (option)
- 10 Fine dust view filter with needle valve (option)
- 11 Fastening screws for the carrying strap bracket or rack-mounting purposes



**Fig. 1-3: BINOS® 100 F, front view**



**Fig. 1-4: BINOS® 100 F magnetically operated front panel , impact tested, front view**

## 1.2 Rear Panel

The rear panels include

- the gas line fittings
- the plug for the electrical supply input
- the subminiature “D” mating socket for the analog signal outputs
- the subminiature “D” plug for the digital outputs (concentration limits / valve control)
- optionally** the subminiature “D” mating plug for analog signal inputs (interference cross compensation, **TC only**)
- optionally** the subminiature “D” mating socket for the RS 232 C / RS 485 interface <sup>1)</sup>
- optionally** the subminiature “D” mating plug for the status signals (relay outputs)

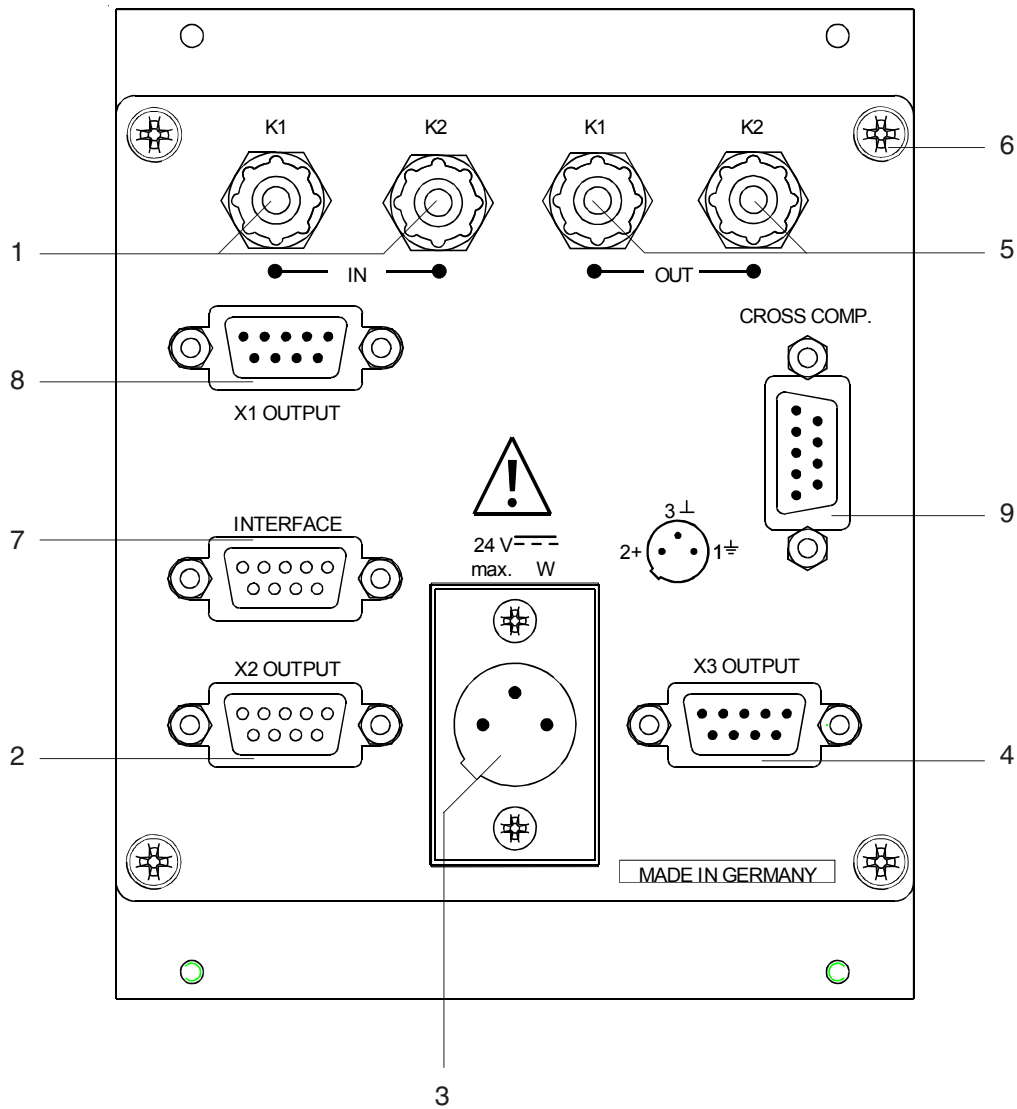
For BINOS® 100 2M/F only:

- optionally** the solenoid valve block
- optionally** the terminal strips for the 7 digital inputs <sup>2)</sup>
- optionally** the terminal strips for the FOUNDATION™ Fieldbus <sup>3)</sup> <sup>4)</sup>

<sup>1)</sup> not in combination with FOUNDATION™ Fieldbus

<sup>2)</sup> BINOS® 100 2M with external power supply only

<sup>3)</sup> not in combination with RS 232/485 interface



**Fig. 1-5: BINOS® 100 (M), OXYNOS® 100 (EO<sub>2</sub>), HYDROS® 100, Rear view**

- 1 Gas inlet line fittings
- 2 **Analog signal output** mating socket
- 3 **24 VDC supply input terminal**
- 4 Plug for **Digital signal output**
- 5 Gas outlet line fittings
- 6 Housing cover fastening screws
- 7 mating socket **Serial Interface** [RS 232 C / 485] (Option)
- 8 Plug for **Output Relays** (Option)
- 9 Plug for analog signal inputs  
(interference cross compensation, **HYDROS® 100** only)

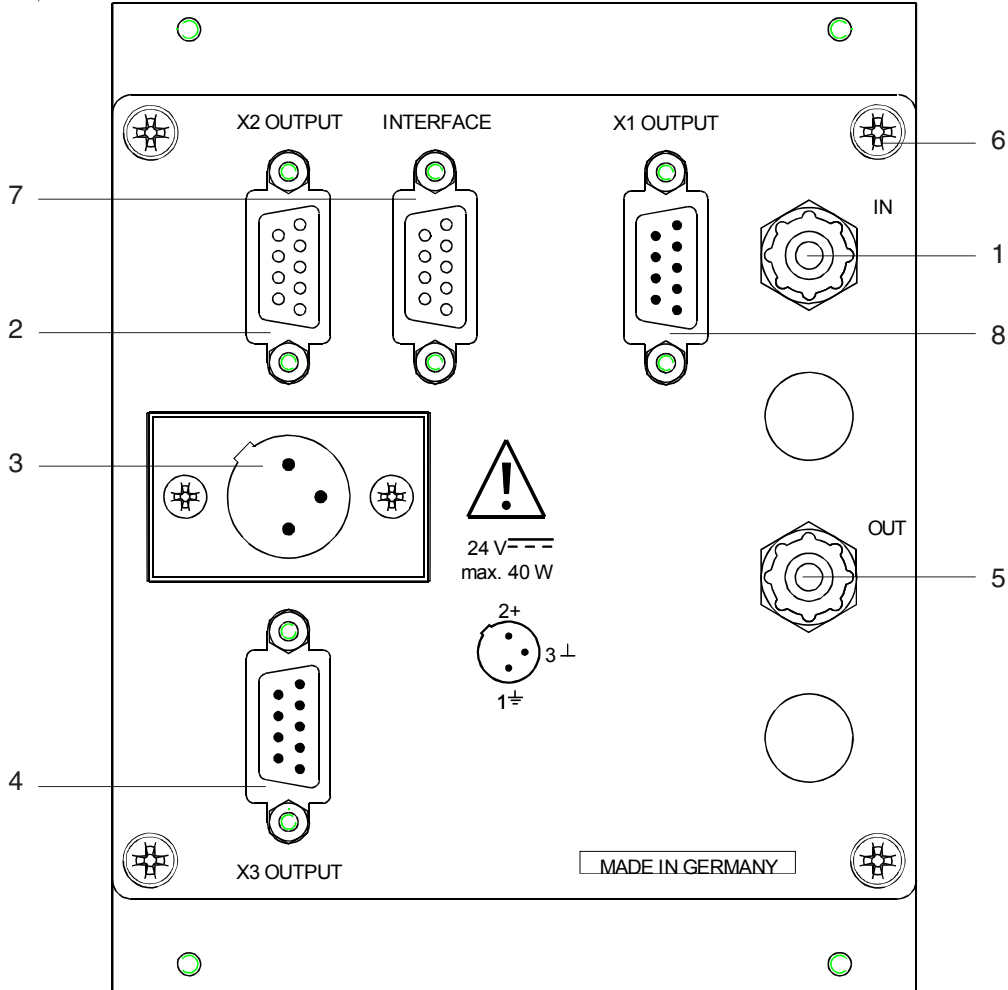
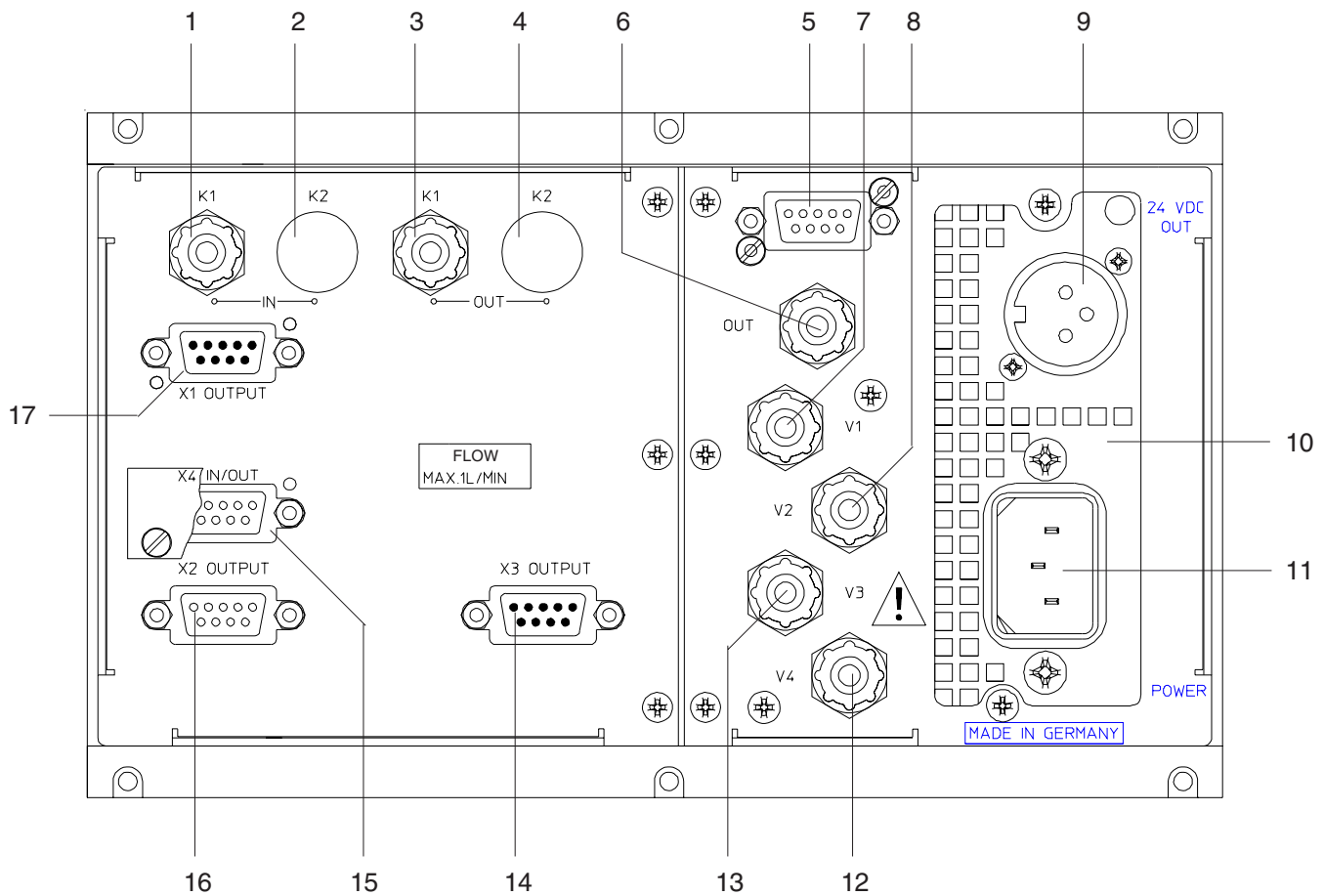


Fig. 1-6: OXYNOS® 100 (PO<sub>2</sub>), Rear view

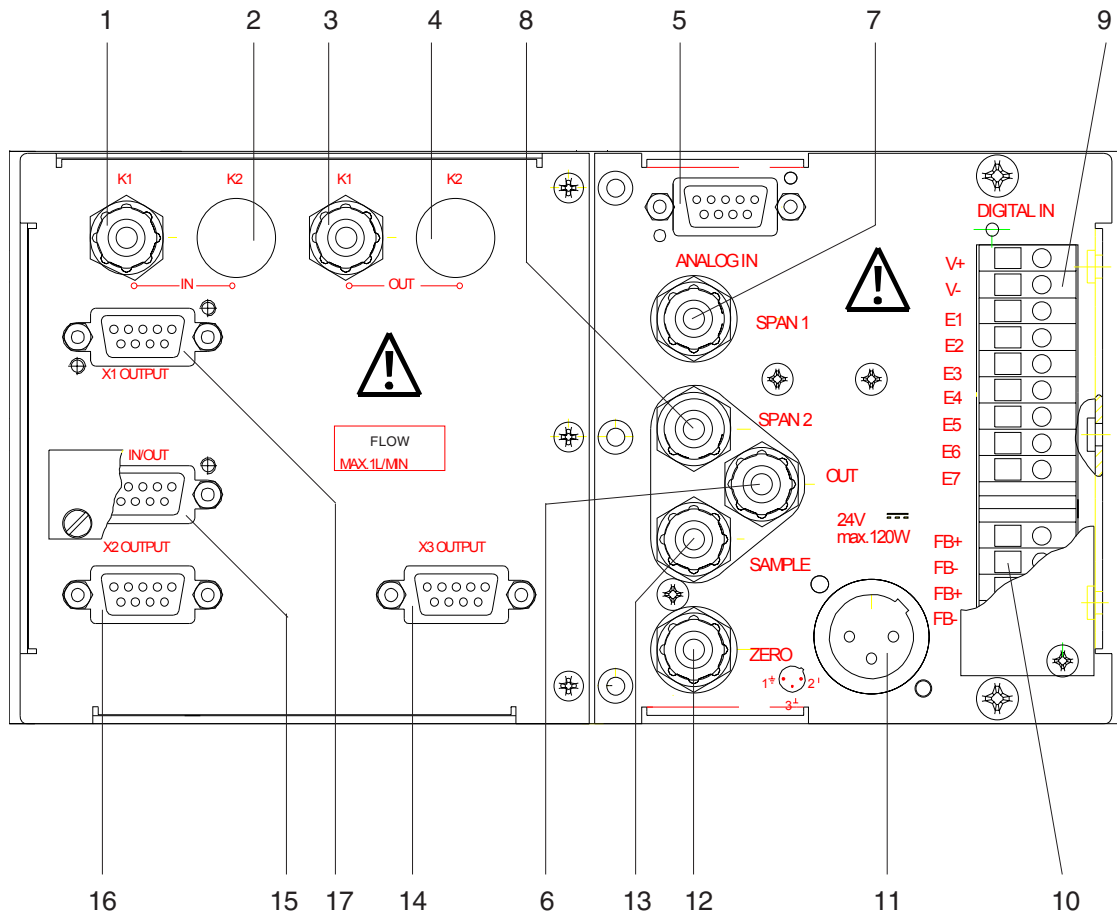
- 1 Gas inlet line fittings
- 2 **Analog signal output** mating socket
- 3 **24 VDC supply input terminal**
- 4 Plug for **Digital signal output**
- 5 Gas outlet line fittings
- 6 Housing cover fastening screws
- 7 mating socket **Serial Interface** [RS 232 C / 485] (Option)
- 8 Plug for **Output Relays** (Option)

**TECHNICAL DESCRIPTION**  
**REAR PANEL**



**Fig. 1-7: BINOS® 100 2M, version A (shown with internal power supply), Rear view with all options**

- 1 Gas inlet line fitting
- 2 2<sup>nd</sup> gas inlet line fitting (option)
- 3 Gas outlet line fitting
- 4 2<sup>nd</sup> gas outlet line fitting (option)
- 5 Plug for analog signal inputs  
(interference cross compensation, **TC only**)
- 6 “Solenoid valves”: common gas outlet line fitting
- 7 “Solenoid valves”: Test gas inlet 1
- 8 “Solenoid valves”: Test gas inlet 2
- 9 24 VDC output (max. 2 A, see technical data)
- 10 Power supply [UPS 01 T (Universal Power Supply)]
- 11 Plug **Power Supply** (Mains line)
- 12 “Solenoid valves”: Zero gas inlet
- 13 “Solenoid valves”: Sample gas inlet
- 14 Plug **Digital Outputs** (threshold contacts)
- 15 Mating socket **Serial Interface** [RS 232 C / 485] (option)
- 16 Mating socket **Analog Signal Outputs**
- 17 Plug **Output Relays** (status signal option)

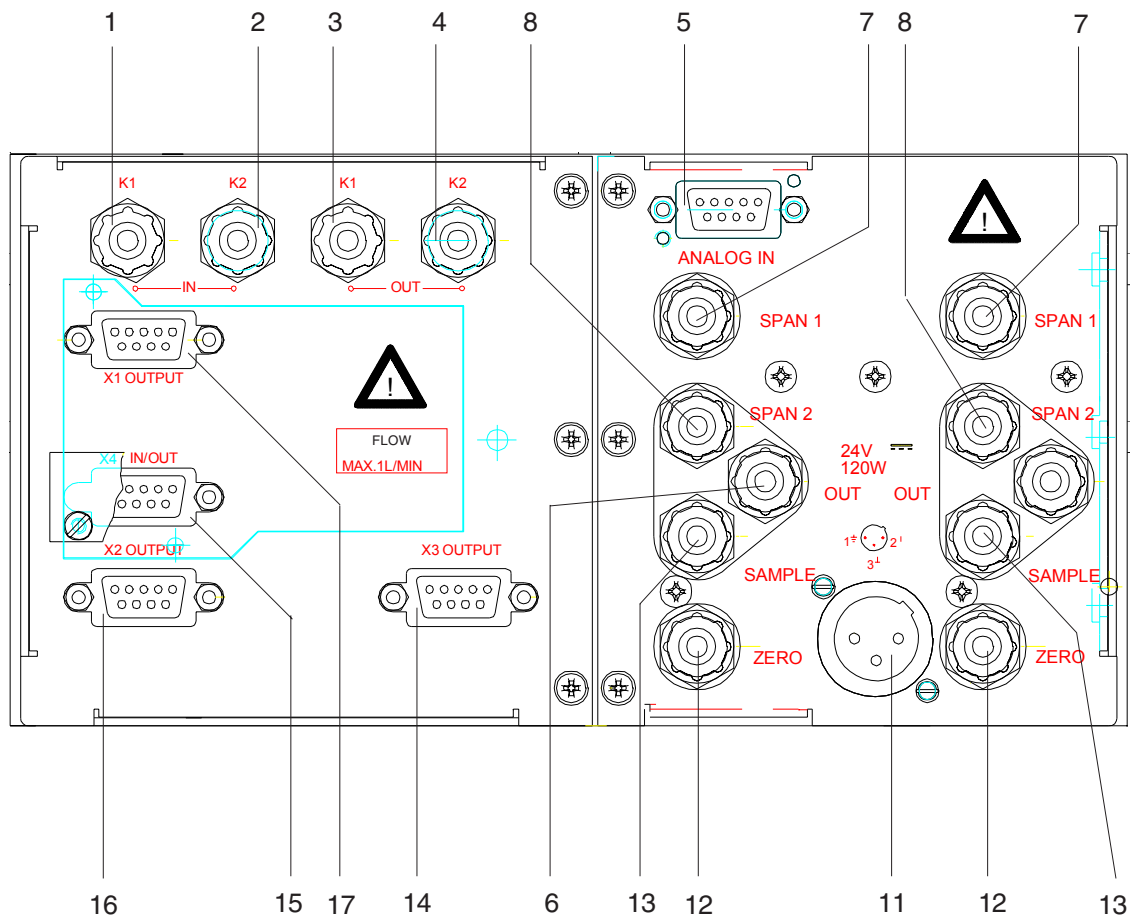


**Fig. 1-8: BINOS® 100 2M, version B (with external power supply), Rear view with all options**

- |    |   |
|----|---|
| 1  | Gas inlet line fitting  |
| 2  | 2 <sup>nd</sup> gas inlet line fitting (option)                                     |
| 3  | Gas outlet line fitting   |
| 4  | 2 <sup>nd</sup> gas outlet line fitting (option)                                    |
| 5  | Plug for analog signal inputs<br>(interference cross compensation, <b>TC only</b> ) |
| 6  | “Solenoid valves”: common gas outlet line fitting                                   |
| 7  | “Solenoid valves”: Test gas inlet 1   |
| 8  | “Solenoid valves”: Test gas inlet 2   |
| 9  | Terminal strips for the 7 <b>Digital Inputs</b> (option)                            |
| 10 | Terminal strips for <b>FOUNDATION™ Fieldbus</b> (option) <sup>*)</sup>              |
| 11 | <b>24 V DC supply input terminal</b>  |
| 12 | “Solenoid valves”: Zero gas inlet   |
| 13 | “Solenoid valves”: Sample gas inlet   |
| 14 | Plug <b>Digital Outputs</b> (threshold contacts)                                    |
| 15 | Mating socket <b>Serial Interface</b> <sup>**) [RS 232 C / 485] (option)</sup>      |
| 16 | Mating socket <b>Analog Signal Outputs</b>  |
| 17 | Plug <b>Output Relays</b> (status signal option)                                    |

<sup>\*)</sup> only possible if serial interface RS 232/485 is not request !

<sup>\*\*)</sup> only possible if FOUNDATION™ Fieldbus is not request !



**Fig. 1-9: BINOS® 100 2M (special version), Rear view with all options**

- 1 Gas inlet line fitting channel 1
- 2 Gas inlet line fitting channel 2
- 3 Gas outlet line fitting channel 1
- 4 Gas outlet line fitting channel 2
- 5 Plug for analog signal inputs  
(interference cross compensation, **TC only**)
- 6 “Solenoid valves”: common gas outlet line fitting
- 7 “Solenoid valves”: Test gas inlet 1
- 8 “Solenoid valves”: Test gas inlet 2
- 9 (open)
- 10 (open)
- 11 **24 V DC supply input terminal**
- 12 “Solenoid valves”: Zero gas inlet
- 13 “Solenoid valves”: Sample gas inlet
- 14 Plug **Digital Outputs** (threshold contacts)
- 15 Mating socket **Serial Interface** [RS 232 C / 485] (option)
- 16 Mating socket **Analog Signal Outputs**
- 17 Plug **Output Relays** (status signal option)



### 1.3 Internal Construction

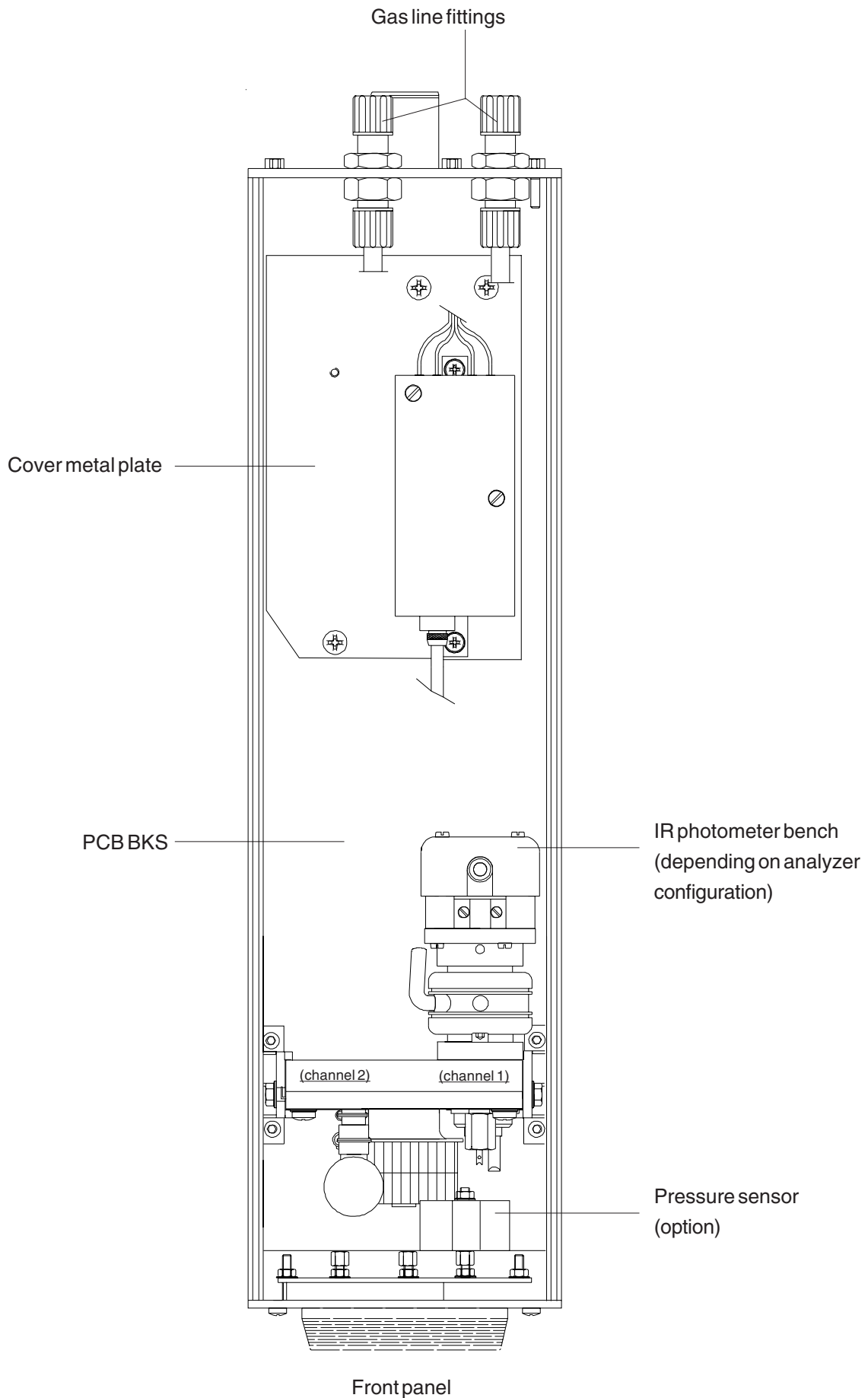
The analyzers includes the following components:

- Depending on analyzer configuration
  - one or two IR photometer benches
  - one IR photometer and one EO<sub>2</sub> sensor
  - one IR photometer and one PO<sub>2</sub> sensor
  - one IR photometer and one TC sensor
  - one PO<sub>2</sub> sensor and one TC sensor
  - one EO<sub>2</sub> sensor and one TC sensor
  - one or two PO<sub>2</sub> sensors
  - one or two EO<sub>2</sub> sensors
  - one or two TC sensors
  
- Optionally one pressure sensor (range of 800 to 1,100 hPa).  
The concentration values computed by the analyzer will then be corrected to reflect the barometric pressure to eliminate faulty measurements due to changes in barometric pressure (see technical data).
  
- Optionally one gas sampling pump (BINOS® 100 2M/F only, see chapter 7.4 and 8.17).  
[pumping rate maxi. 2,5 l/min. (special solution with 2 pumps with parallel gas paths)].
  
- BINOS® 100 2M (standard version) / BINOS® 100 F:  
Integrated power supply (230/120 V AC).
  
- Optionally solenoid valve unit  
(BINOS® 100 2M/F only, special solution with 2 valve blocks with parallel gas paths).

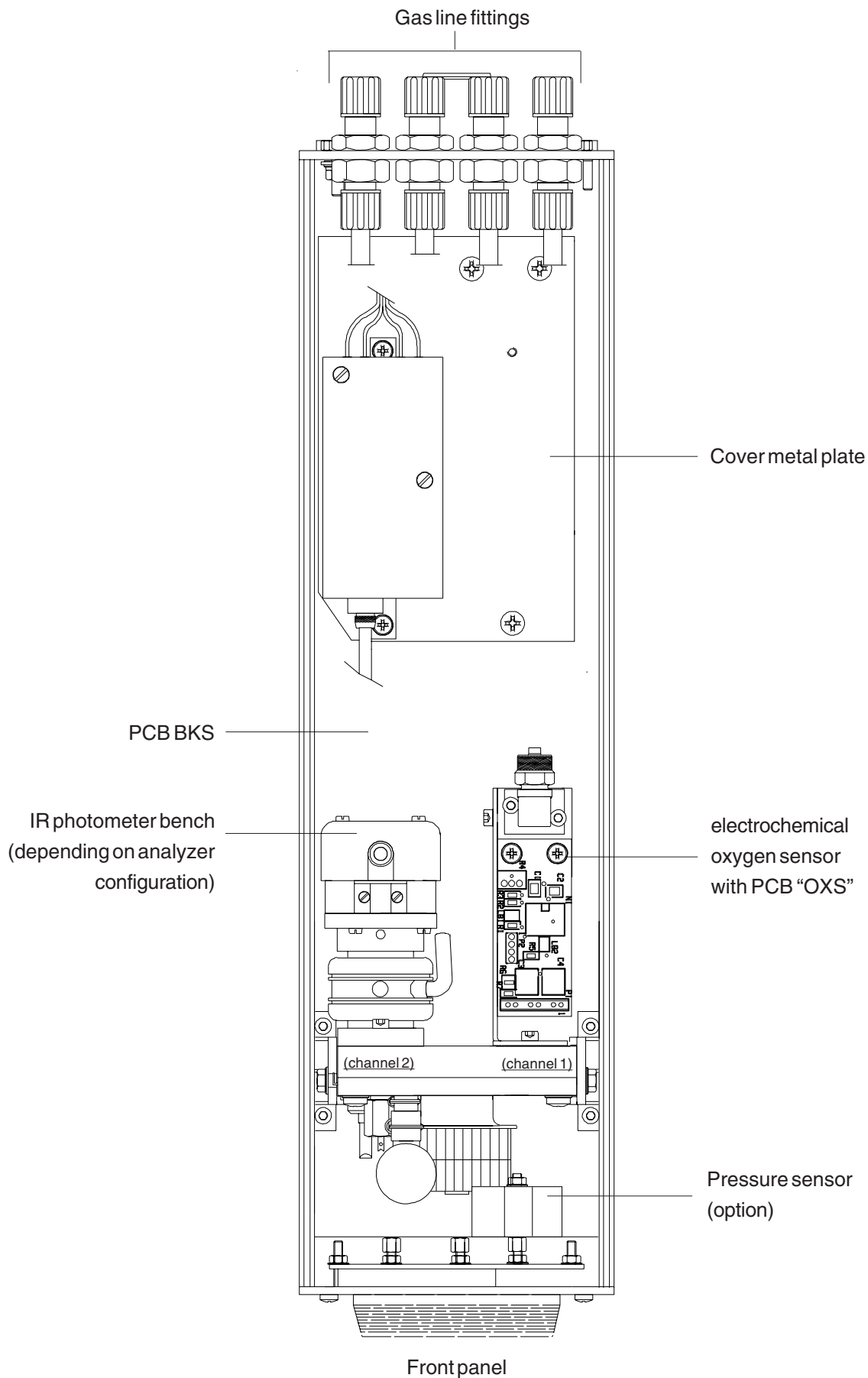
For this case there are built-in 4 (8) solenoid valves (Sample Gas - Zero Gas - Span Gas 1 - Span Gas 2) at the analyzer.

For manual or automatical adjustment the zero gas and the span gases will be fed to the solenoid valves controlled by the analyzer.

If a solenoid valve is open there is illuminated a green LED (Fig. 1-2, Item 3) at the front panel.



**Fig. 1-10: Inside View BINOS® 100**  
(1 IR channel analyzer, high measuring range with gas detector)



**Fig. 1-11: Inside View BINOS® 100 M**  
(IR channel/electrochemical oxygen measurement)

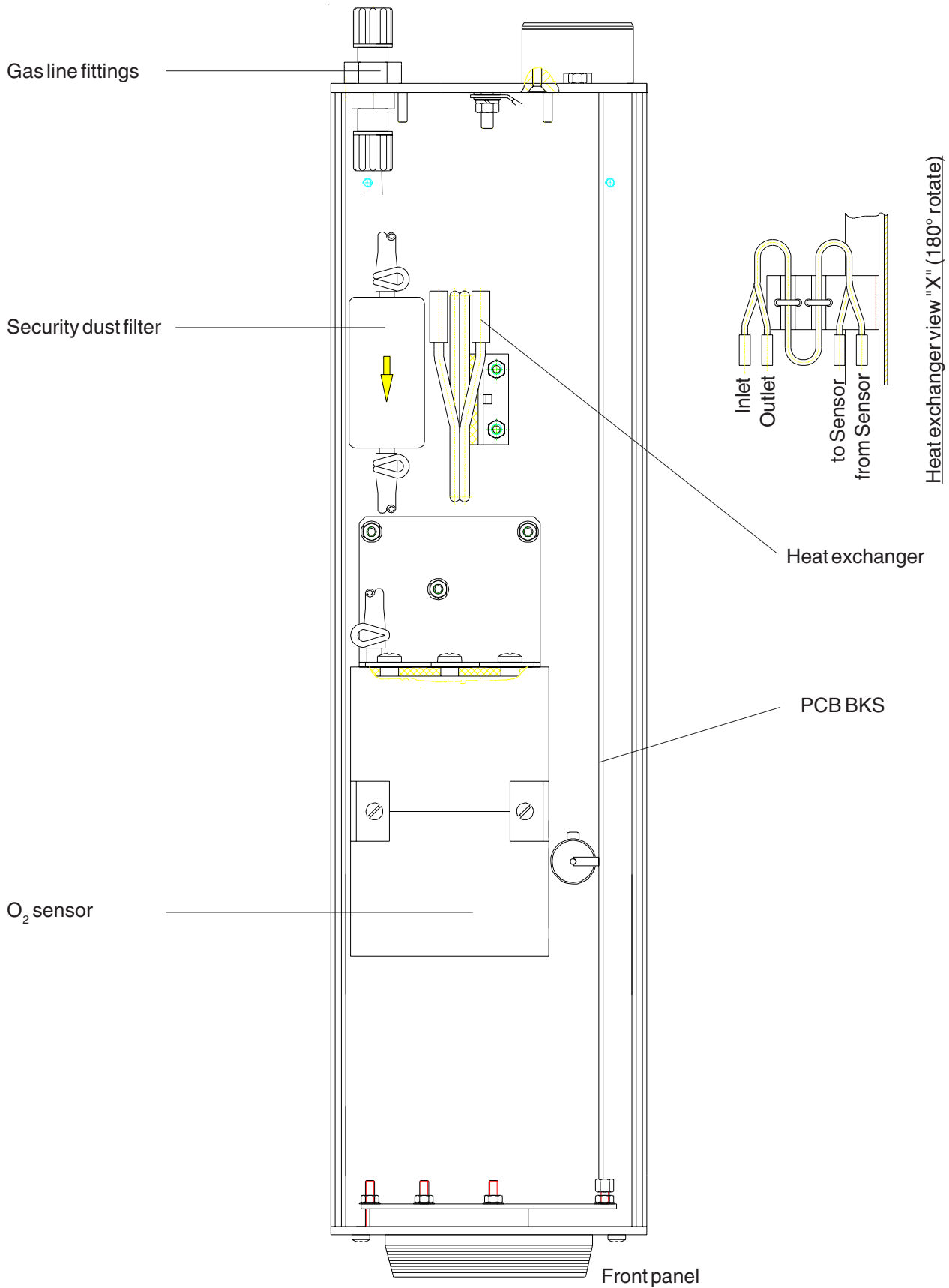
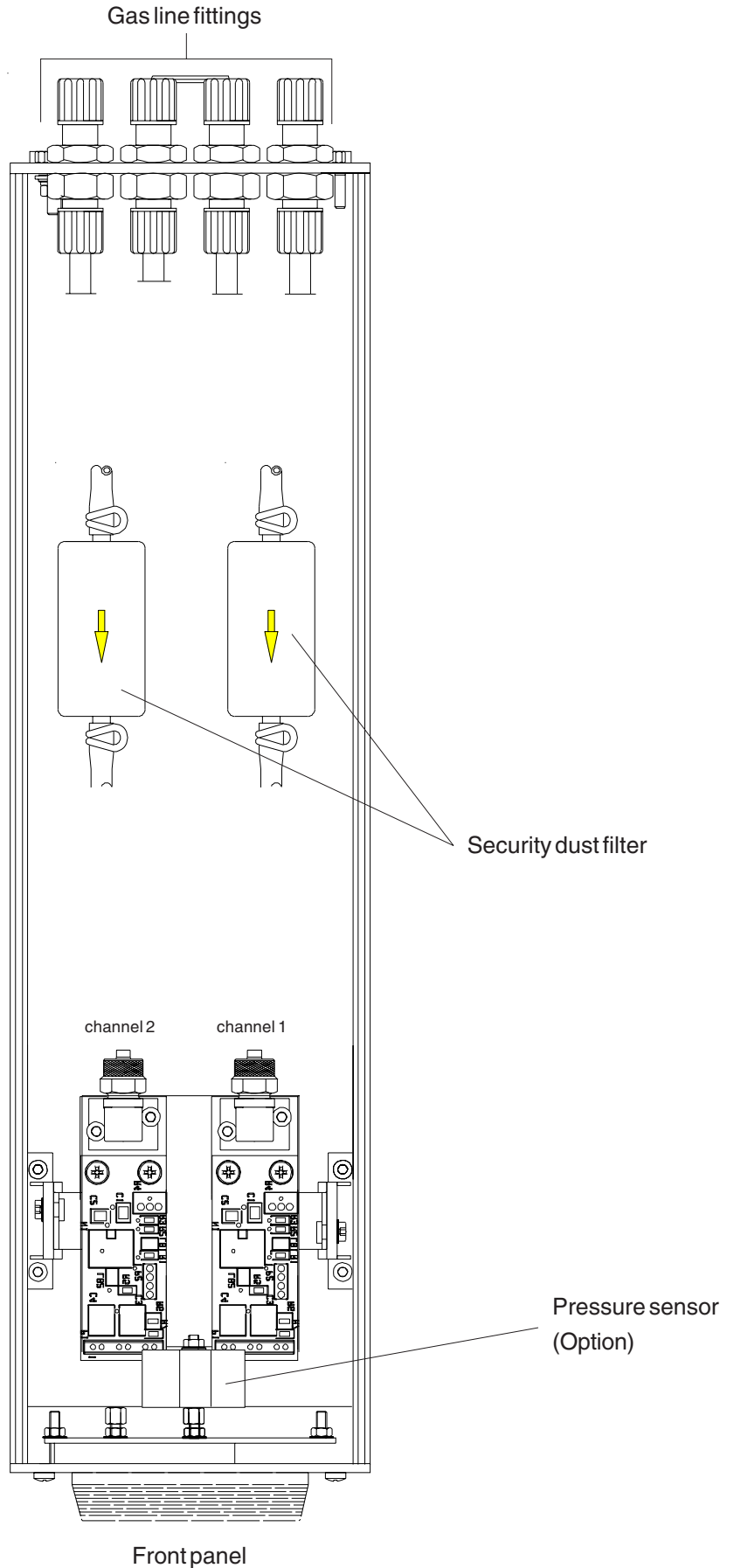
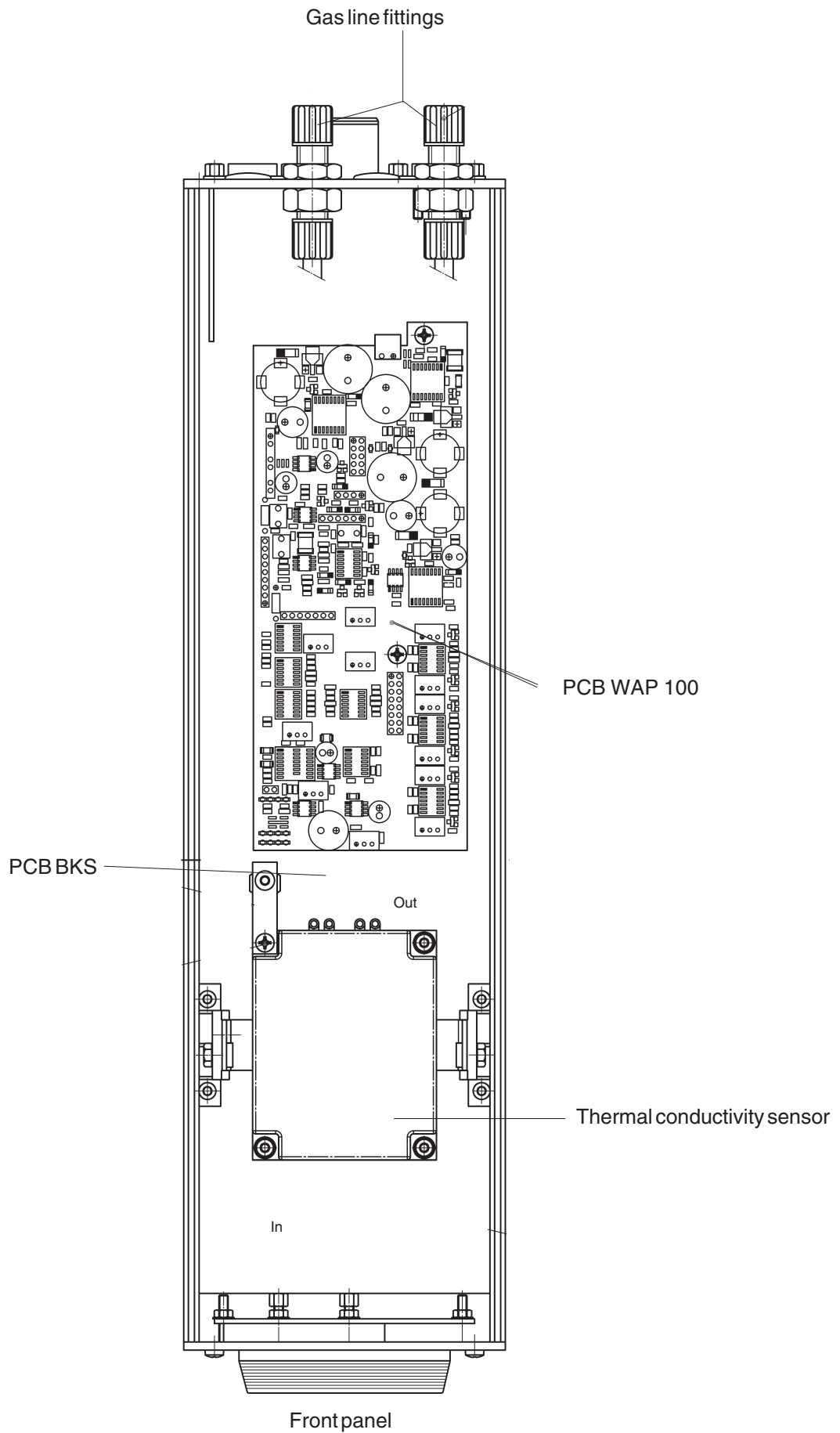


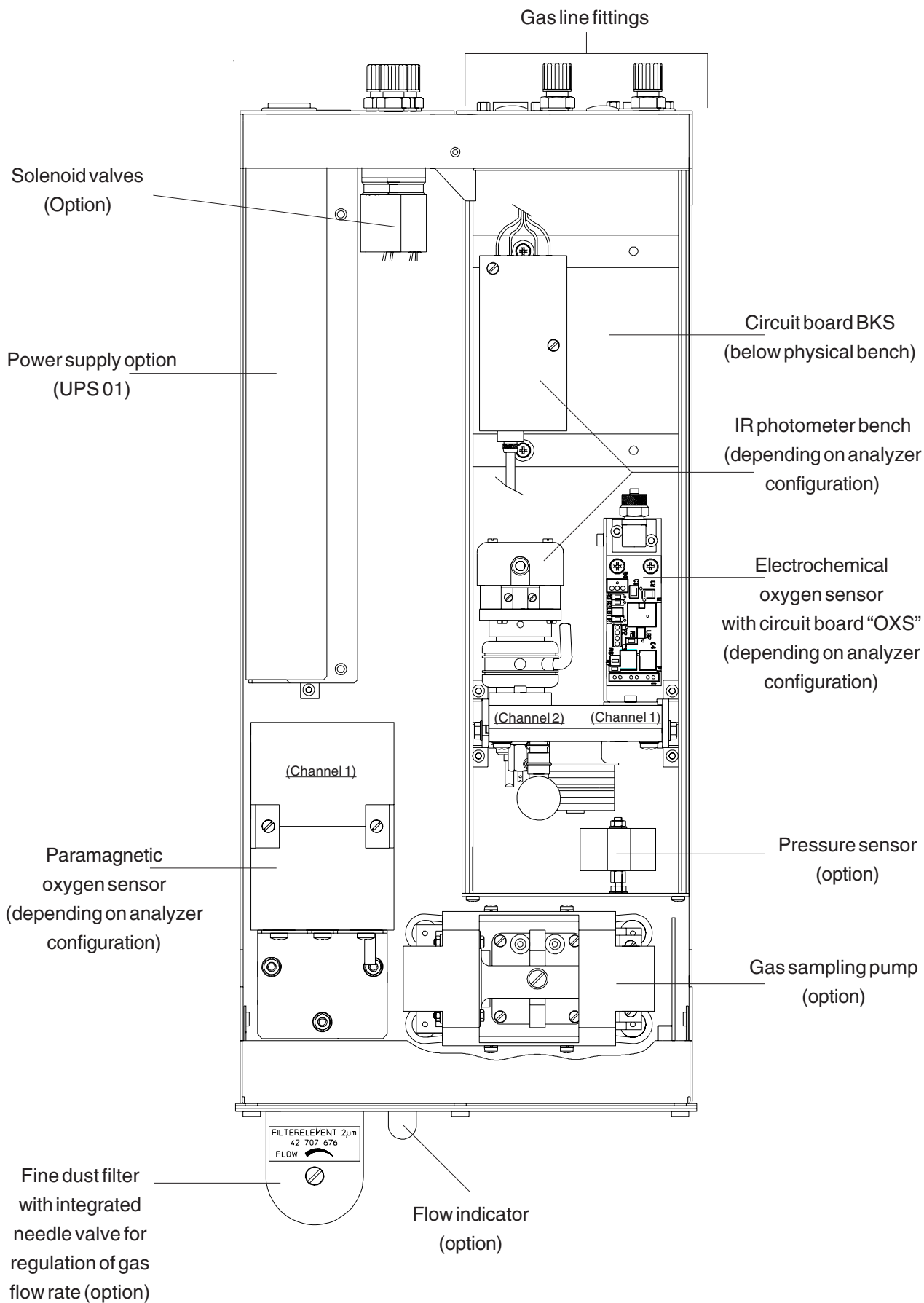
Fig. 1-12: OXYNOS® 100, Inside View with paramagnetic sensor



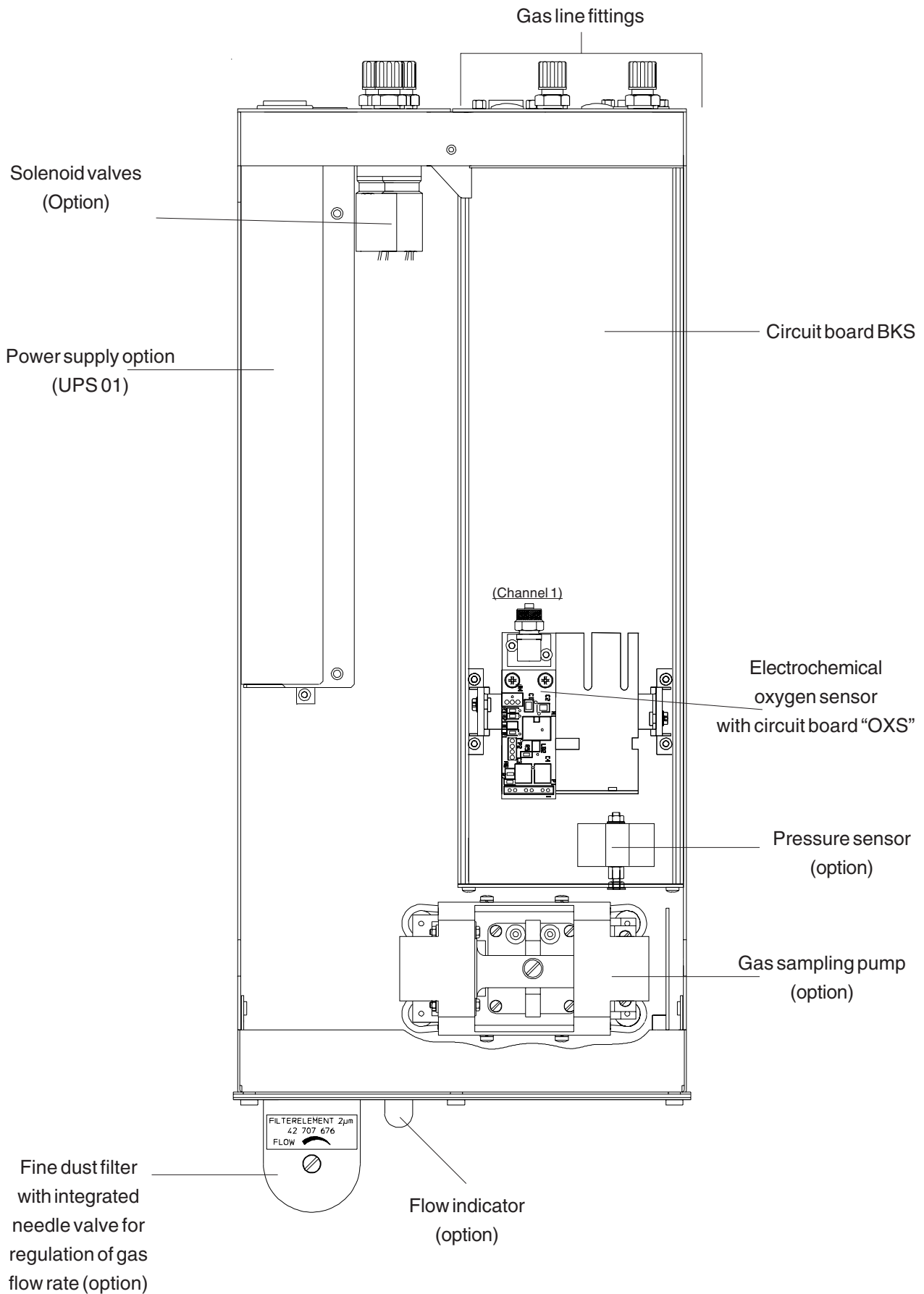
**Fig. 1-13: OXYNOS® 100, Inside view with electrochemical sensor**



**Fig. 1-14: HYDROS<sup>®</sup> 100, Inside view**

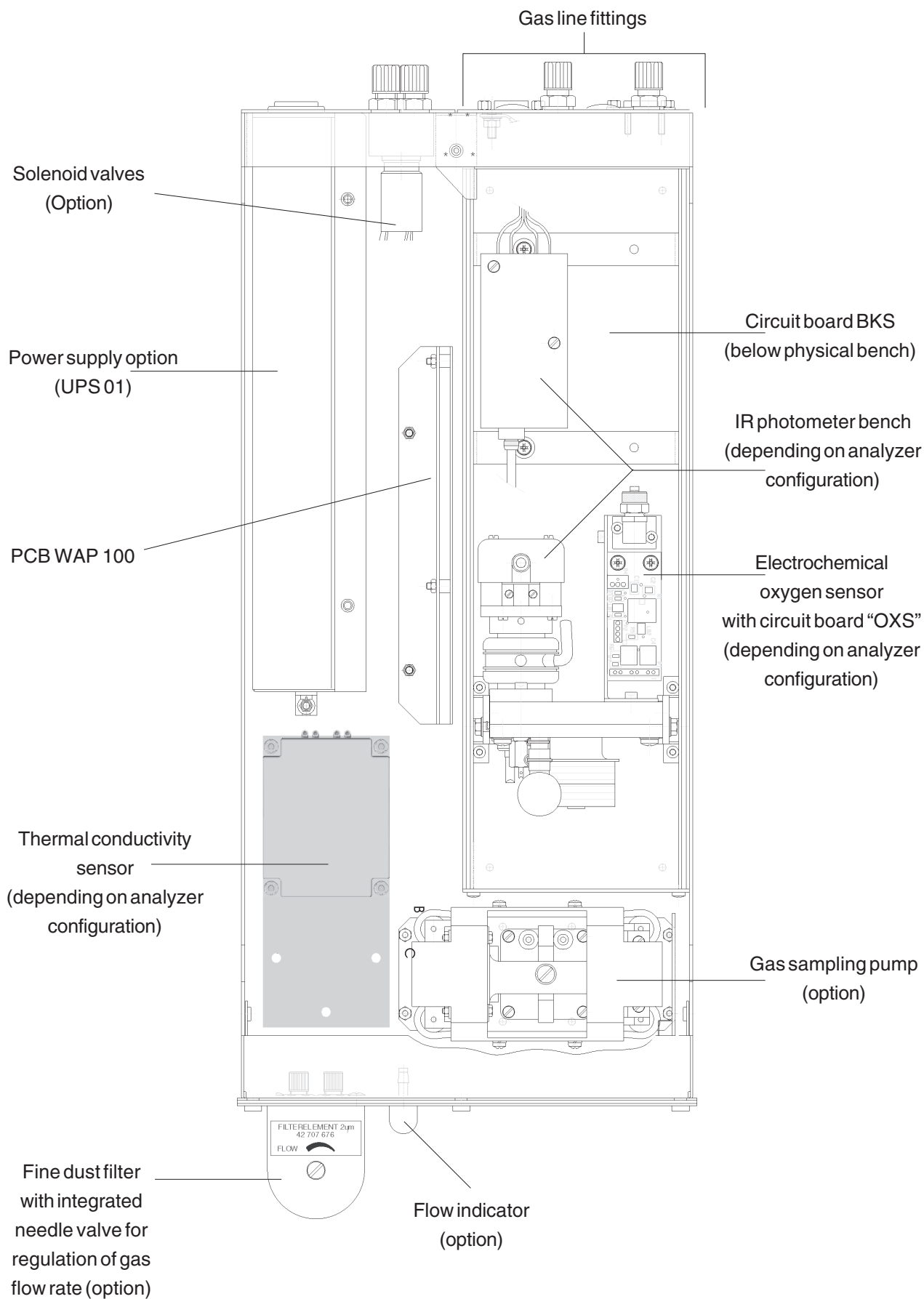


**Fig. 1-15: Inside View dual-channel BINOS® 100 2M (version A)**  
(IR channel/oxygen measurement, combined)

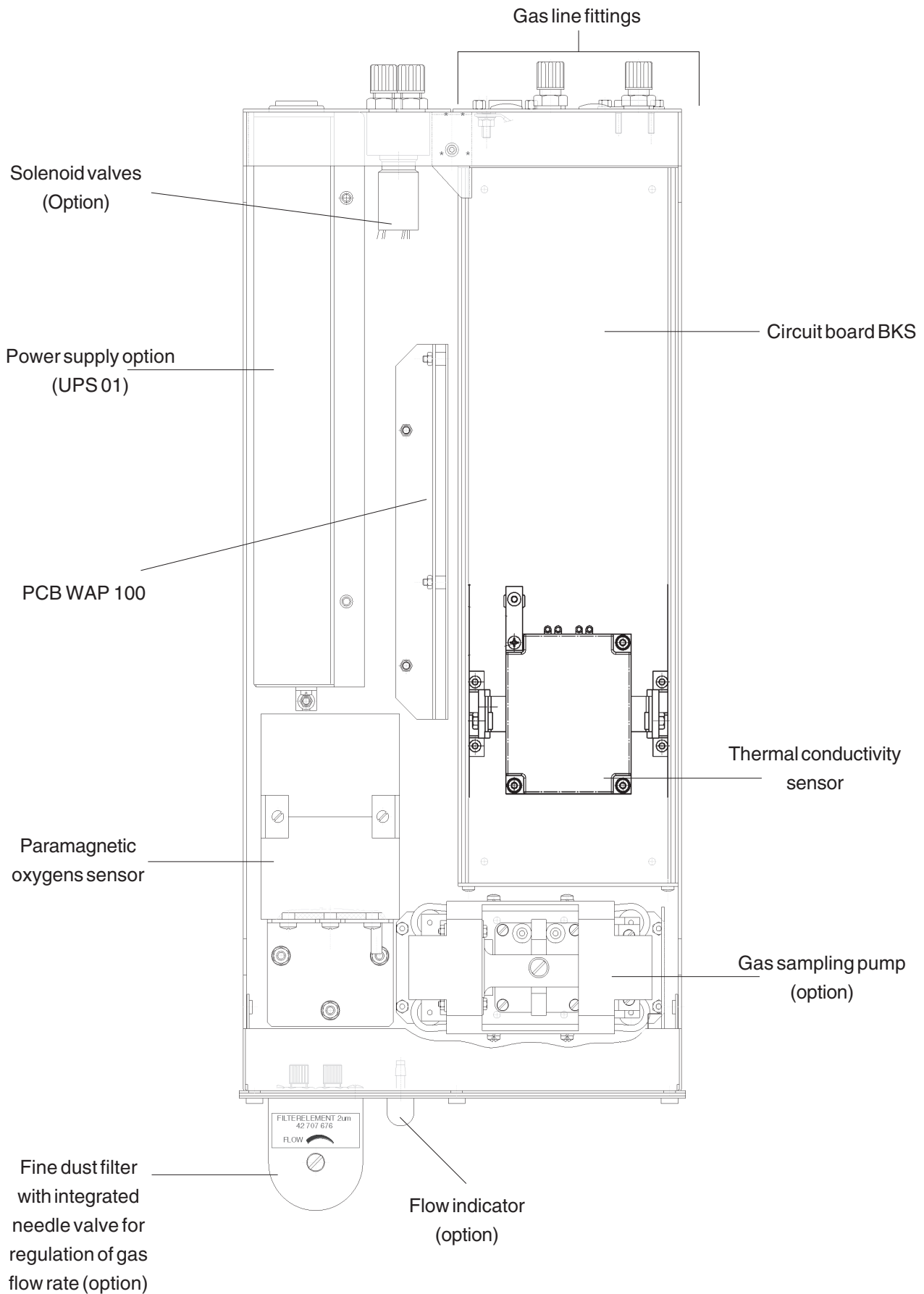


**Fig. 1-16: Inside View BINOS® 100 2M (version A)**  
(1 channel oxygen measurement, electrochemical)

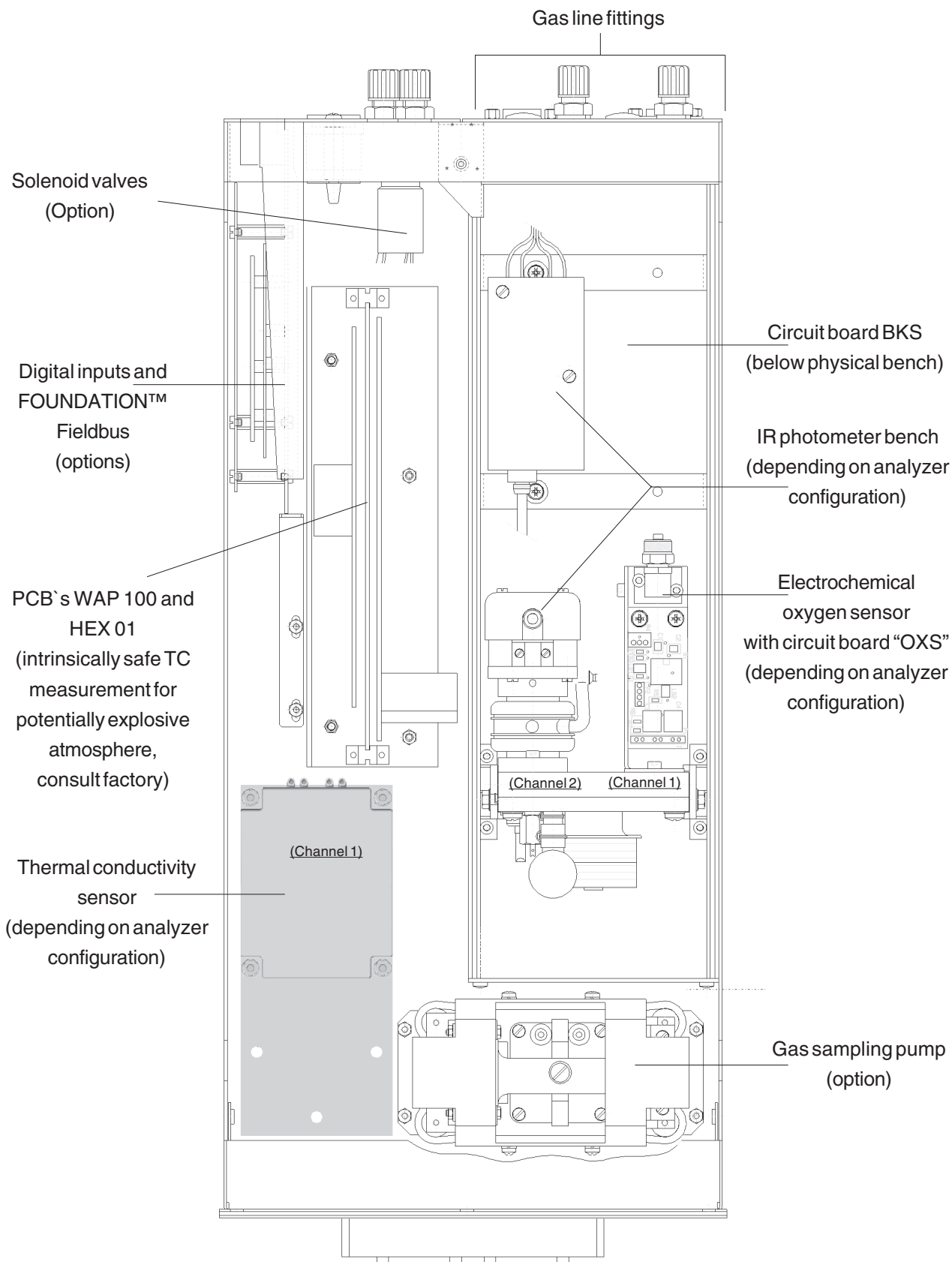




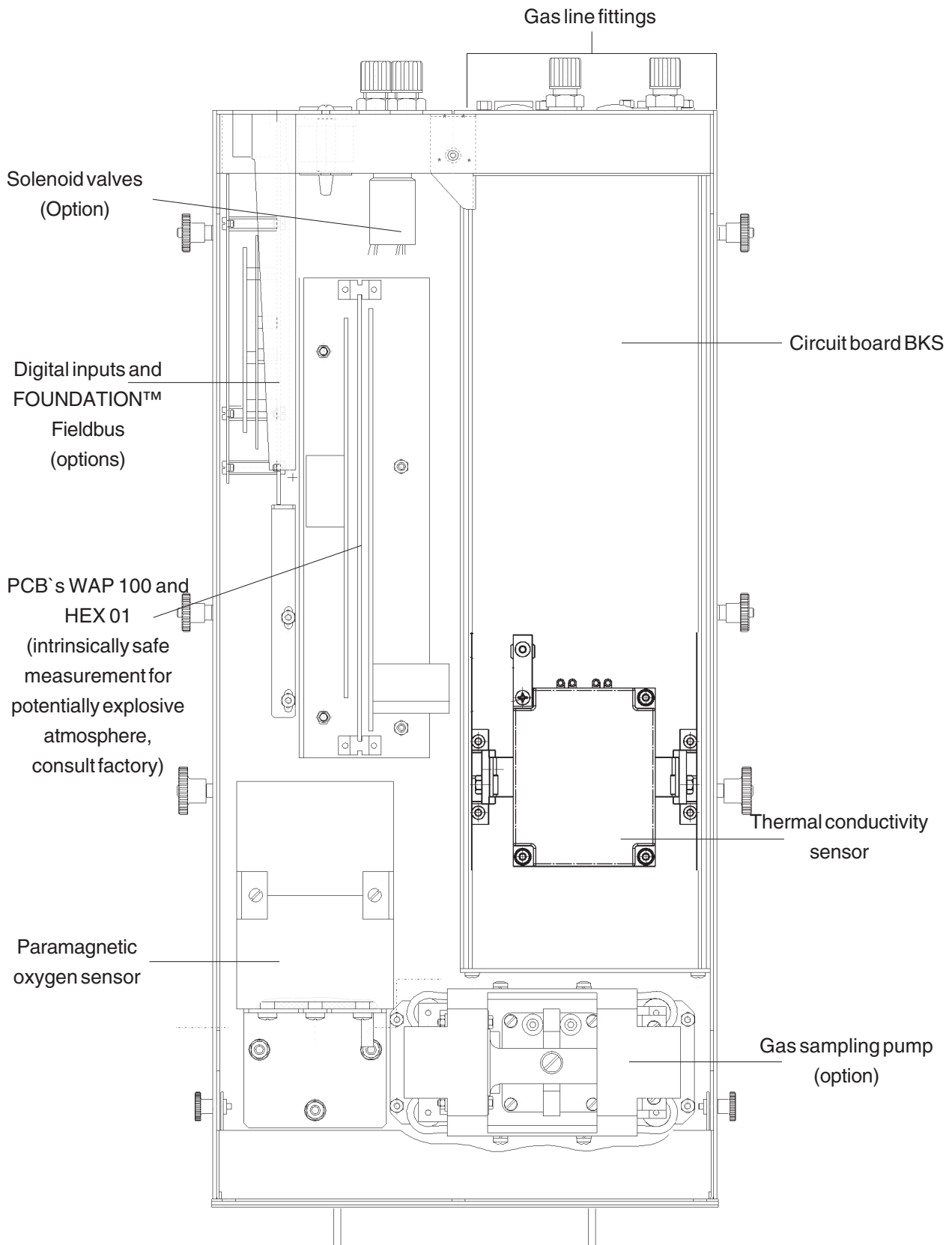
**Fig. 1-17: Inside View dual-channel BINOS® 100 2M (version A)**  
(IR/EO<sub>2</sub>, TC/EO<sub>2</sub> or IR/TC measurement, combined)



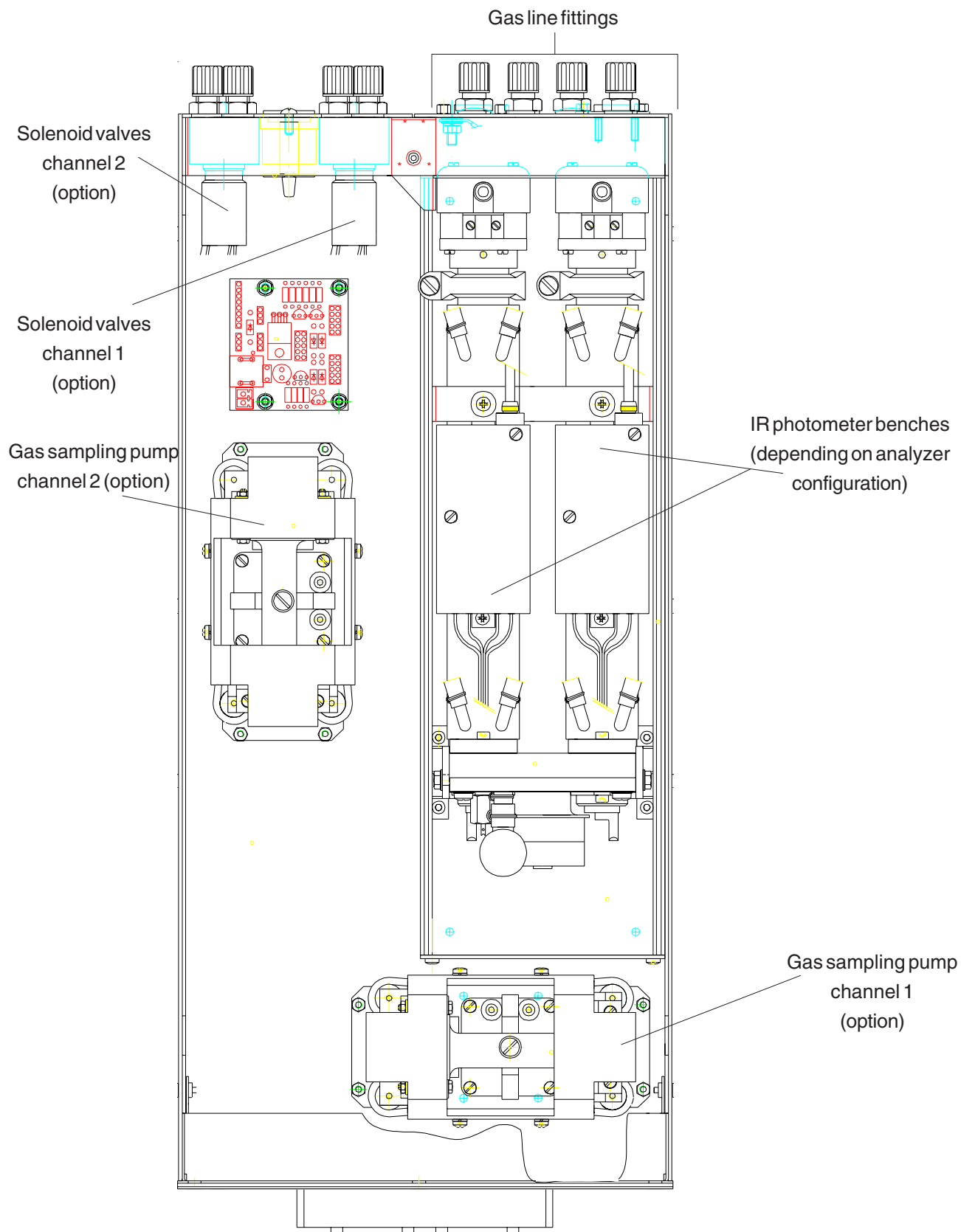
**Fig. 1-18: Inside View dual-channel BINOS® 100 2M (version A)**  
(oxygen measurement (paramagnetic) / thermal conductivity measurement, combined)



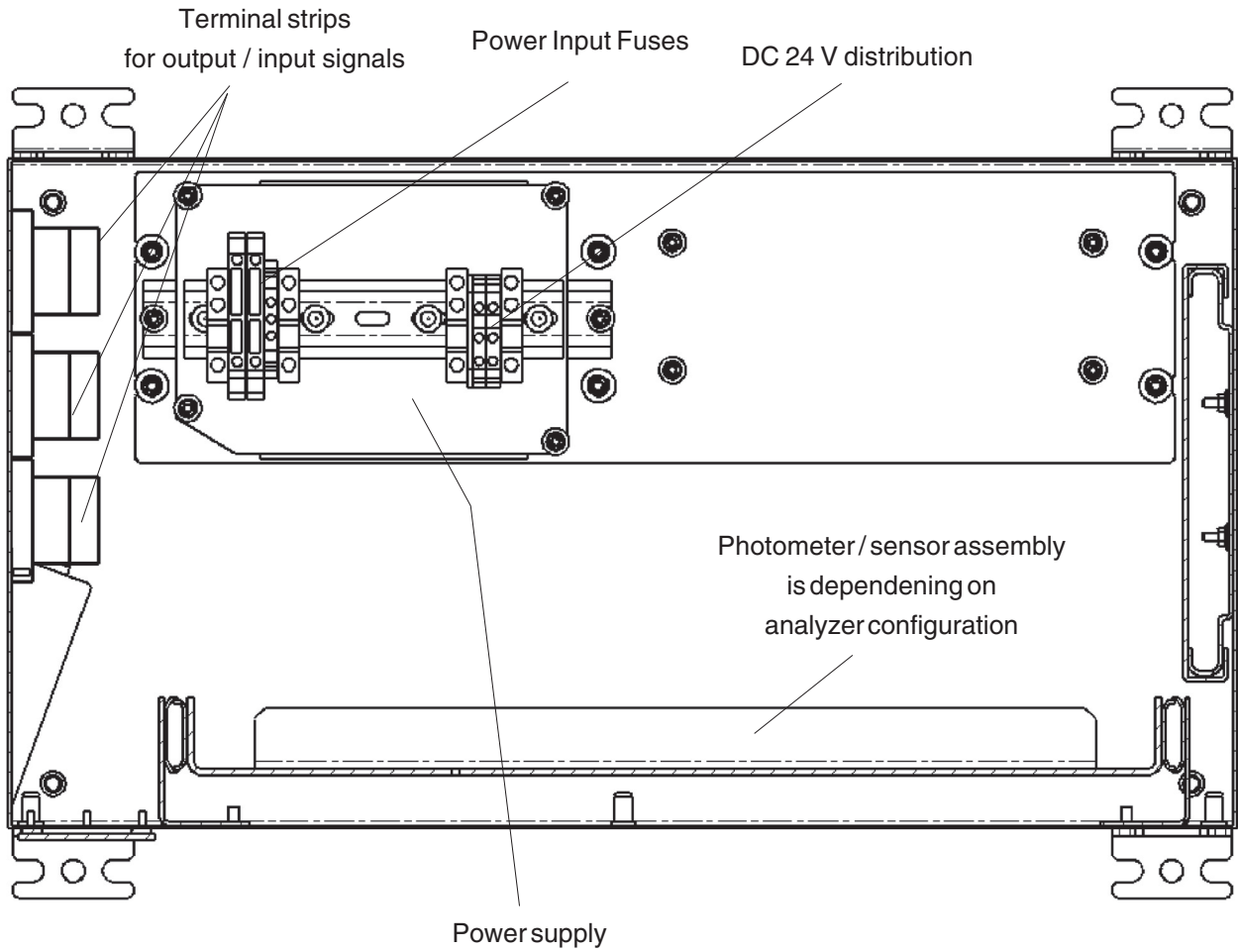
**Fig. 1-19: Inside View dual-channel BINOS® 100 2M (version B)**  
*(IR channel/oxygen measurement, combined)*



**Fig. 1-20: Inside view dual-channel BINOS® 100 2M w. external P/S (here: version for CAT)**  
*(paramagnetic oxygen measurement & thermal conductivity measurement)*



**Fig. 1-21: Inside View dual-channel BINOS® 100 2M (special version)**  
(two gas sampling pumps and two solenoid valve blocks)



**Fig. 1-22: Inside View BINOS® 100 F (field housing)**

### 1.3.1 Internal Gas Paths

The materials used for the gas paths are selected according to the application. In making such selection the diffusion rates of the individual gas components, their corrosivity, and the temperature and pressure of the sampled gas must be taken into account.

#### a) Gas Path Material

The physical and chemical properties of the sampled gas and the operating conditions (temperature and pressure) of the analyzer determine the materials which are used for gas paths and gas fittings.

##### Safety Dust Filter

All analyzers are equipped with a PTFE safety dust filter. This filter is no substitute for the necessary dust filter to be provided with sample handling systems (described in chapter 5.2).

##### Fittings

As standard the analyzers are provided with PVDF fittings, 6/4 mm. The analyzers can be delivered with swagelok® fittings, stainless steel, 6/4 mm or 1/4" as option.

Additional fittings are delivered as special options.

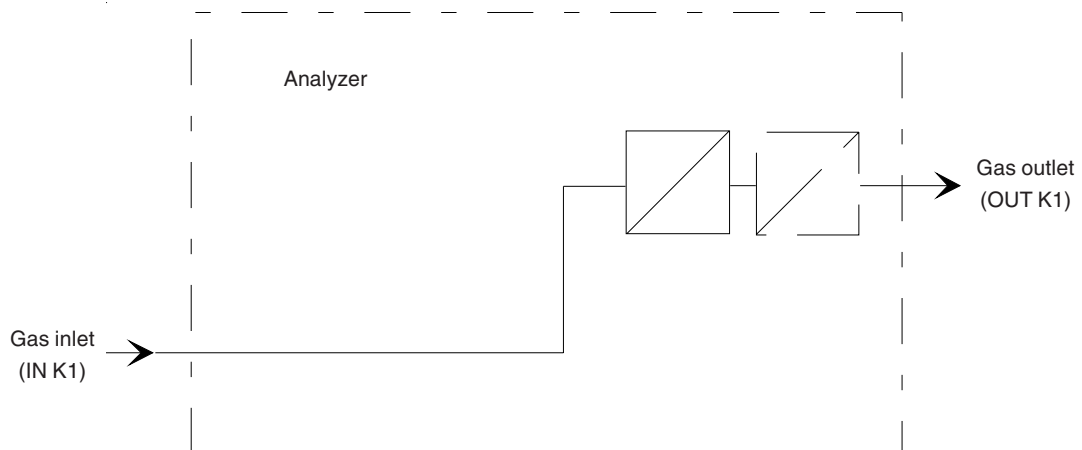
##### Tubing

As standard the analyzers are provided with Viton tubings or PTFE tubings (6/4 mm).

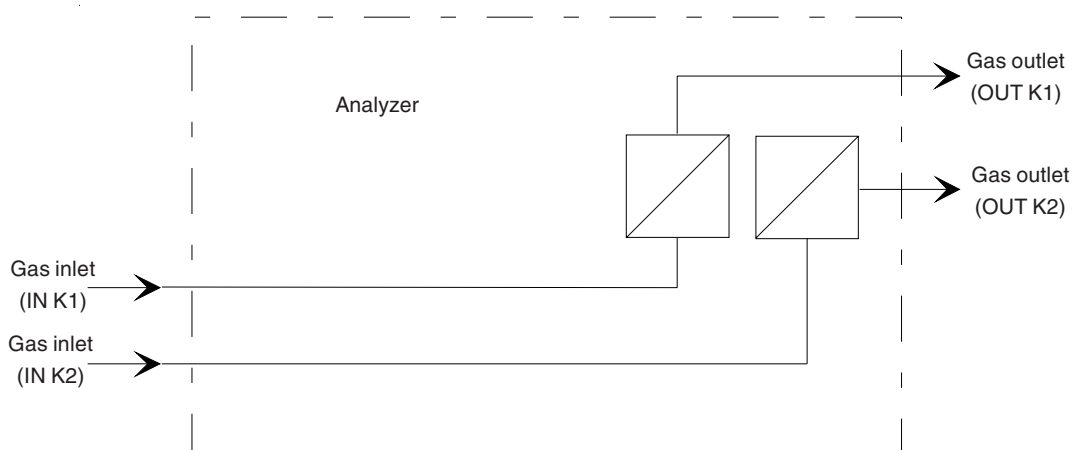
Additional tubings (e.g. stainless steel) are delivered as special options.

**b) Gas Path Layout (internal tubing)**

The principle various possible layouts of the internal gas lines are summarized in the following figures.

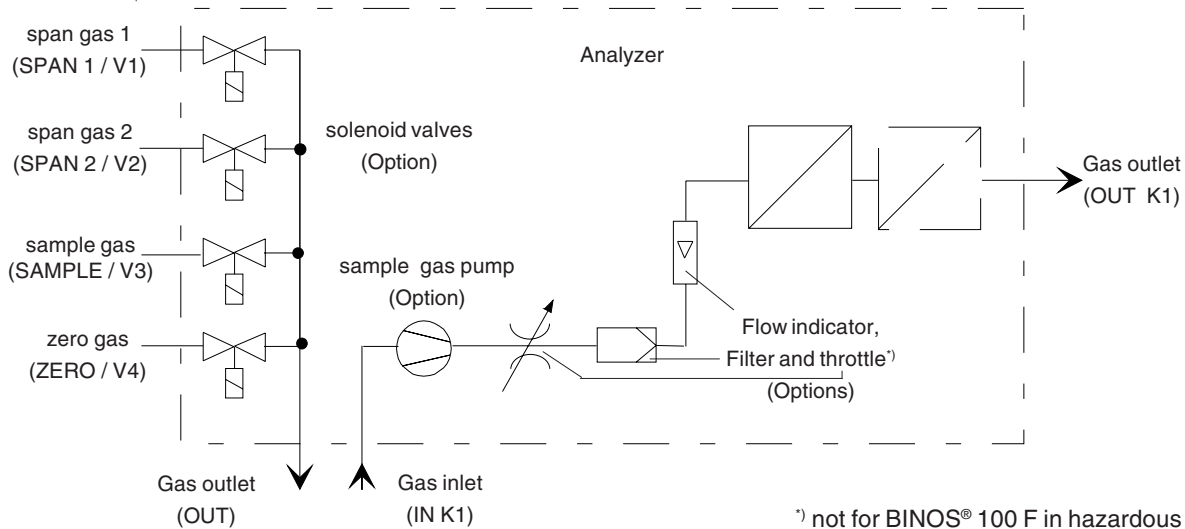


**Fig. 1-23: Tubing in series (BINOS® 100 (M), OXYNOS® 100, HYDROS® 100 analyzers)**

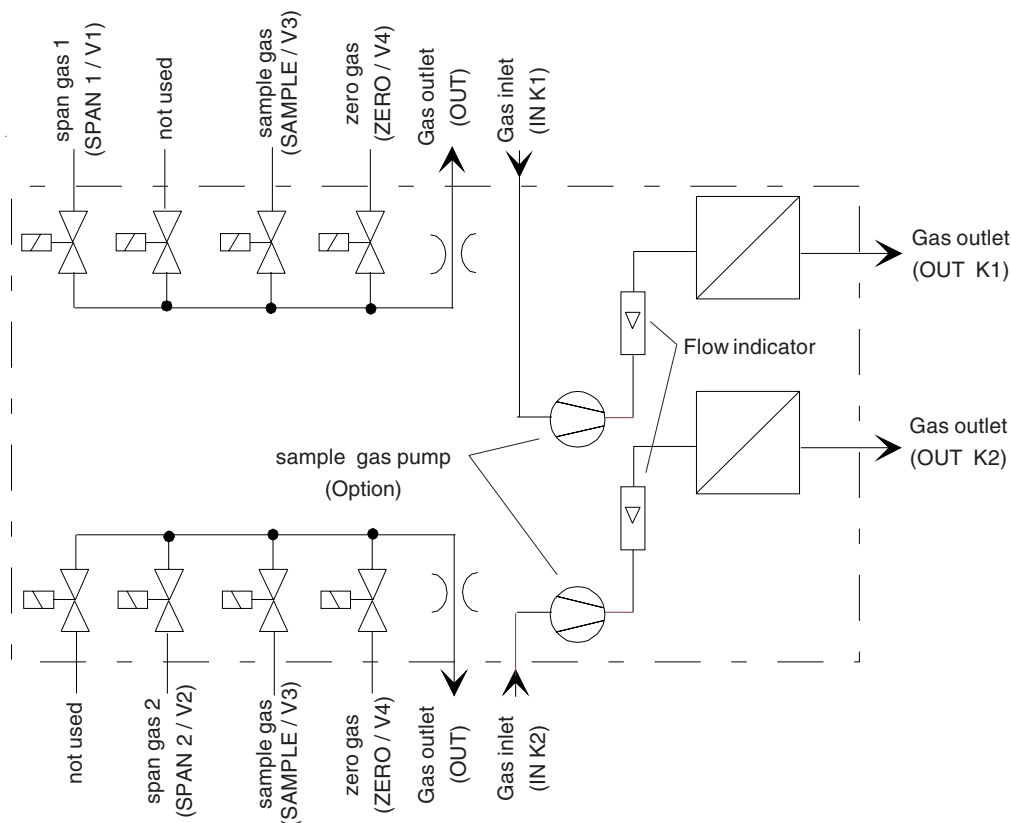


**Fig. 1-24 Tubing in parallel (BINOS® 100 (M), OXYNOS® 100, HYDROS® 100 analyzers)**





**Fig. 1-25: Tubing in series (BINOS® 100 2M analyzers)**  
(equipped with all options)



**Fig. 1-26: Tubing in parallel (special version of BINOS® 100 2M analyzer)**  
(equipped with all options)



## 2. Measuring Principle

Depending on the gas to be analyzed different measuring methods will be used.

### 2.1 IR Measurement

The analyzers are non-dispersive infrared photometers (NDIR) using measurement of selective absorption in a column of gas.

The measuring effect derived from absorption of infrared radiation is due to the gas being measured. The gas specific wavelengths of the absorption bands characterize the type of gas while the strength of the absorption gives a measure of the concentration of the component measured. Due to a rotation chopper wheel, the radiation intensities coming from measuring and reference side of the analysis cell produce periodically changing signals within the detector.

The detector signal amplitude thus alternates between concentration dependent and concentration independent values. The difference between the two is a reliable measure of the concentration of the absorbing gas component.

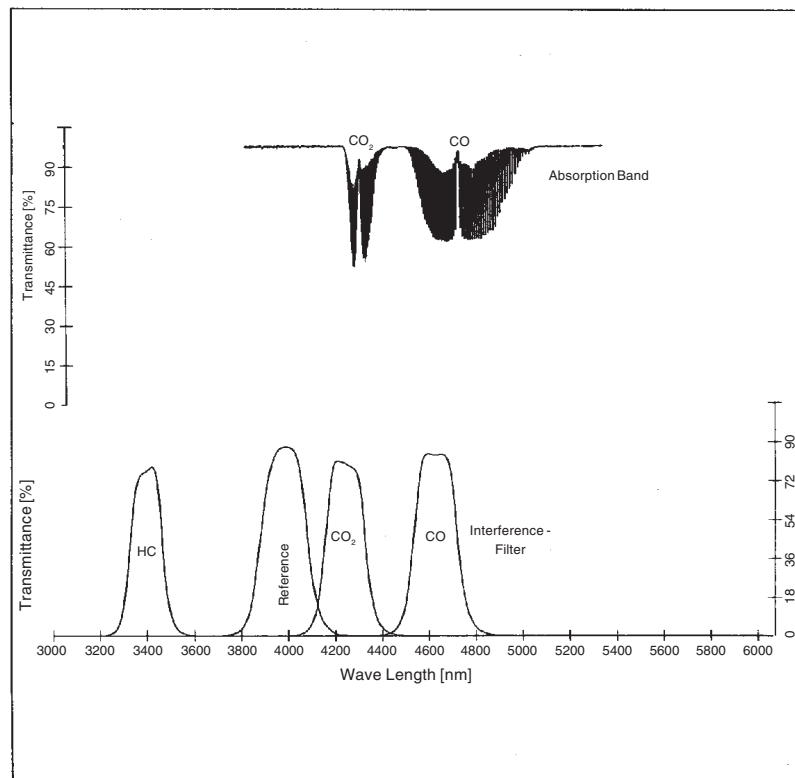
Dependent on measuring component and measuring concentration, two different measuring methods will be used.

#### 2.1.1 Interference Filter Correlation (IFC Principle)

The undivided analysis cell is alternately illuminated with filtered light concentrated in one of two spectral separated wave length ranges. One of these two spectrally separated wave length bands is chosen to coincide with an absorption band of the sample gas, and the other is chosen such that none of the gas constituents expected to be encountered in practice absorbs anywhere within the band.

The spectral transmittance curves of the interference filters used in the 100 series analyzer and the spectral absorption of the gases CO and CO<sub>2</sub> are shown in Fig. 2-1. It can be seen that the absorption bands of these gases each coincide with the passbands of one of the interference filters. The fourth interference filter, used for generating a reference signal, has its passband in a spectral region where none of these gases absorb. Most of the other gases of interest also do not absorb within the passband of this reference filter.

**MEASURING PRINCIPLE**  
**IR MEASUREMENT**



**Fig. 2-1: Absorption Bands of Sample Gases and Transmittance of the Interference Filters used**

The signal generation happens by a pyroelectrical (solid-state) detector.

The detector records the incoming IR radiation. This radiation intensity is reduced by the absorption of the gas at the corresponding wave lengths. By comparing the intensity at measuring and reference wave length an alternating voltage signal is developed. This signal results from cooling and heating of the pyroelectrical material of the detector.

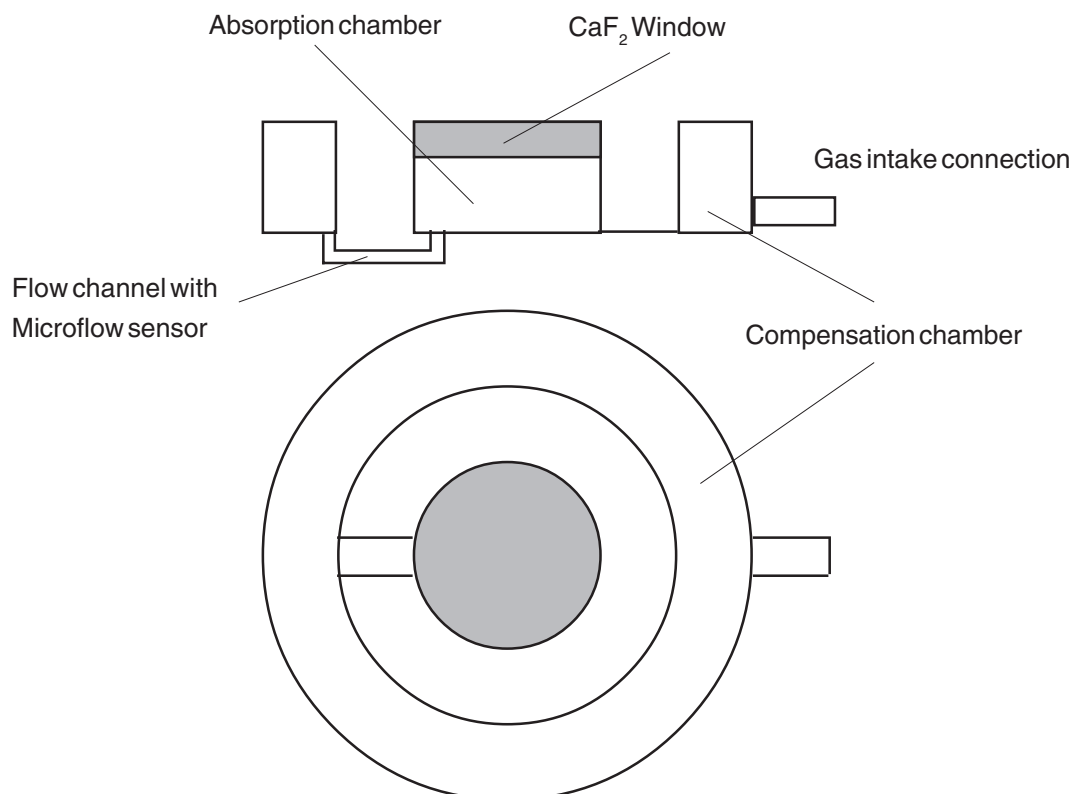
### 2.1.2 Opto-Pneumatic Measuring Principle

A thermal radiator generates the infrared radiation passing through a chopper wheel. This radiation alternately passes through a filter cell and reaches the measuring and reference side of the analysis cell with equal intensity.

After passing another filter cell the radiation reaches the pneumatic detector.

The pneumatic detector compares and evaluates the radiation from the measuring and reference sides and converts them into voltage signals proportional to their intensity via a preamplifier.

The detector consists of a gas-filled absorption and a compensation chamber which are interconnected via a flow channel.



**Fig. 2-2: Principle Design of Gas Detector**

## MEASURING PRINCIPLE

### IR MEASUREMENT

In principle the detector is filled with the infrared active gas to be measured and is only sensitive to this distinct gas with its characteristic absorption spectrum. The absorption chamber is sealed with a window which are transparent for infrared radiation [usually  $\text{CaF}_2$  (Calcium fluoride)].

When the IR radiation passes through the reference side of the analysis cell into the detector, no preabsorption occurs. Thus the gas inside the absorption chamber is heated, expands and some of it passes through the flow channel into the compensation chamber.

When the IR radiation passes through the open measurement side of the analysis cell into the detector, a part of it is absorbed depending on sample gas concentration. The gas in the absorption chamber then is heated less than in the case of radiation coming from reference side. Absorption chamber gas become colder, gas pressure in the absorption chamber is reduced and some gas of compensation chamber passes through the flow channel into the absorption chamber.

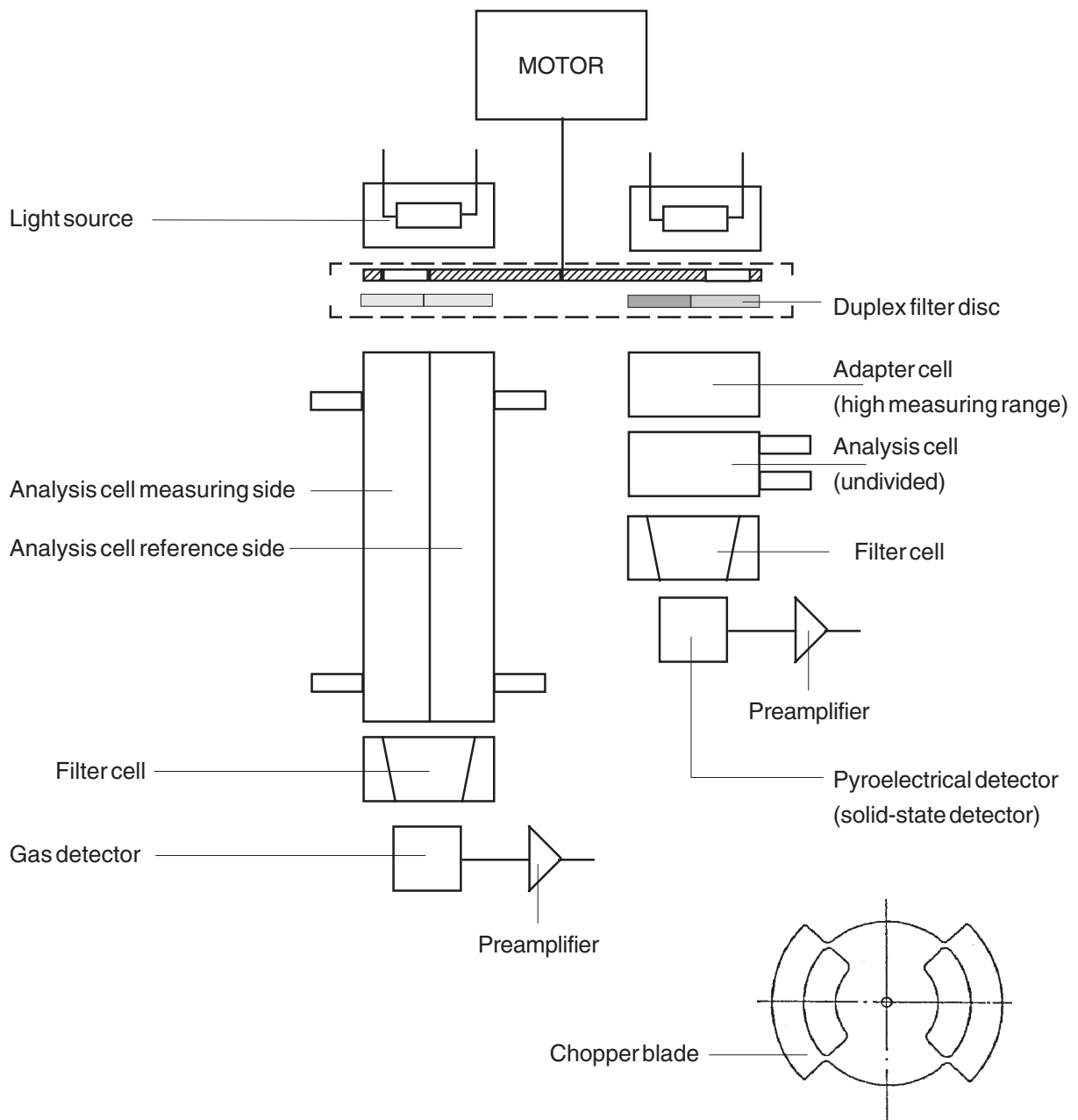
The flow channel geometry is designed in such a way that it hardly impedes the gas flow by restriction. Due to the radiation of chopper wheel, the different radiation intensities lead to periodically repeated flow pulses within the detector.

The microflow sensor evaluates this flow and converts it into electrical voltages.

The electronics, which follow, evaluate the signals and convert them into the corresponding display format.

### 2.1.3 Technique

The broadband emission from two IR sources (in the case of dual channel analyzers) passes through the chopper blade, then, if IFC, through combinations of interference filters, if optopneumatic principle depending on application through an optical filter (reduction of influences) and enters the analysis cells. The light transmitted through these cells is focused by filter cells onto the according detector. The preamplified detector output signal is sent to microprocessor circuitry, which converts the analytical signals to results expressed directly in physical concentration units (Vol.-%, ppm, mg/Nm<sup>3</sup> etc.).



**Fig. 2-3: Principle Representation**

## MEASURING PRINCIPLE

### OXYGEN MEASUREMENT (PO<sub>2</sub> PARAMAGNETIC PRINCIPLE)

## 2.2 Oxygen Measurement

Depending on analyzer model different measuring methods will be used.

The installed type of oxygen sensor is to identify at the channel code (see Fig. 1-1).

% O<sub>2</sub> para. = paramagnetic Sensor

% O<sub>2</sub> chem. = electrochemical Sensor

### 2.2.1 Paramagnetic Measurement

The determination of O<sub>2</sub> concentration is based on the paramagnetic principle (magneto-mechanic principle).

Two nitrogen filled (N<sub>2</sub> is diamagnetic) quartz spheres are arranged in a "dumbbell" configuration and suspended free to rotate on a thin platinum ribbon in a cell.

A small mirror that reflects a light beam coming from a light source to a photodetector, is mounted on this ribbon. A strong permanent magnet especially shaped to produce a strong highly inhomogeneous magnetic field inside the analysis cell, is mounted outside the wall.

When oxygen molecules enter the cell, their paramagnetism will cause them to be drawn towards the region of greatest magnetic field strength. The O<sub>2</sub> molecules thus exert different forces which produce a torque acting on the sphere arrangement, and the suspended "dumbbell", along with the mirror mounted on its suspension ribbon, will be angularly rotated away from the equilibrium position.

The mirror then will deflect an incident light beam onto the photodetector which itself produces an electric voltage. The electric signal is amplified and fed back to a conducting coil at the "dumbbell", forcing the suspended spheres back to the equilibrium position.

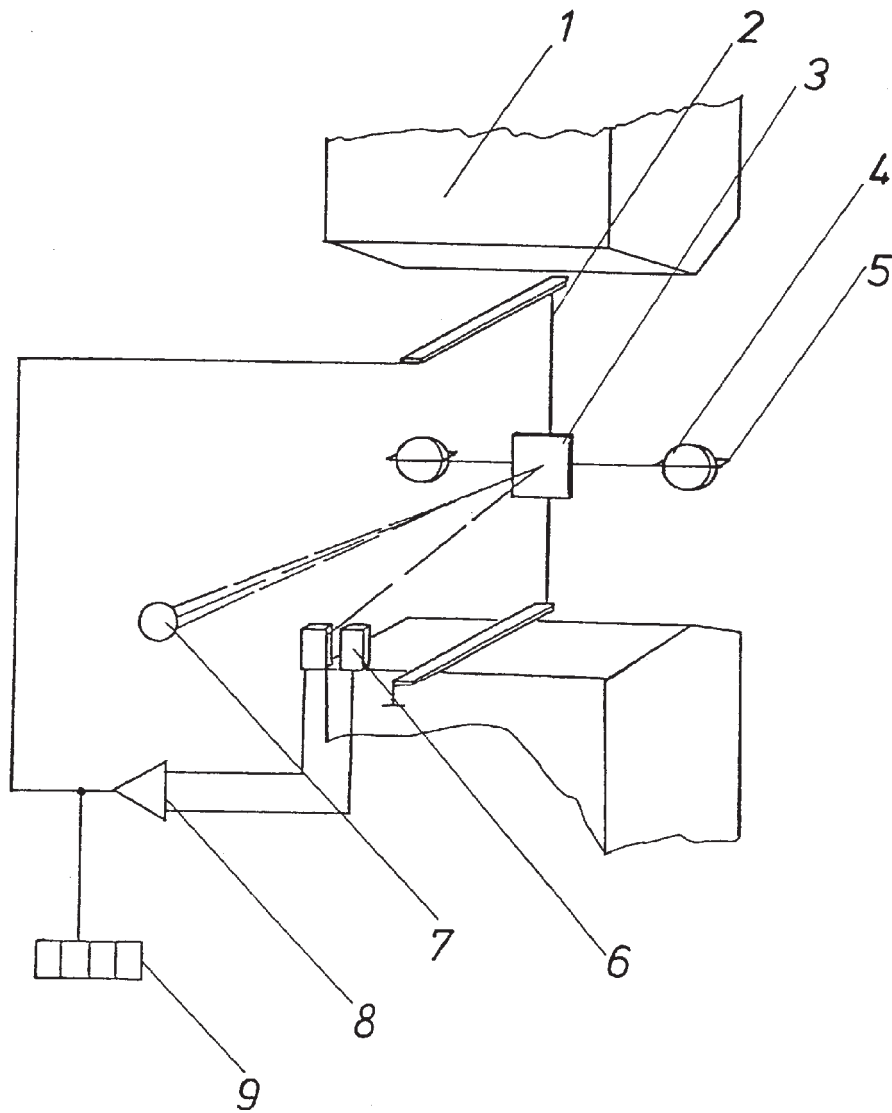
The current required to generate the restoring torque to return the "dumbbell" to its equilibrium position is a direct measure of the O<sub>2</sub> concentration in the gas mixture.

The complete analysis cell consists of analysis chamber, permanent magnet, processing electronics, and a temperature sensor. The sensor itself is thermostat controlled up to approx. 55 °C. For warming up the measuring gas is conducted via a heat-exchanger.

Optionally we have built-in a solvent resistant cell or an intrinsic safe cell for potentially explosive atmosphere.



**MEASURING PRINCIPLE**  
**OXYGEN MEASUREMENT (PO<sub>2</sub> PARAMAGNETIC PRINCIPLE)**



**Fig. 2-4: Principle Construction of paramagnetic Analysis Cell**

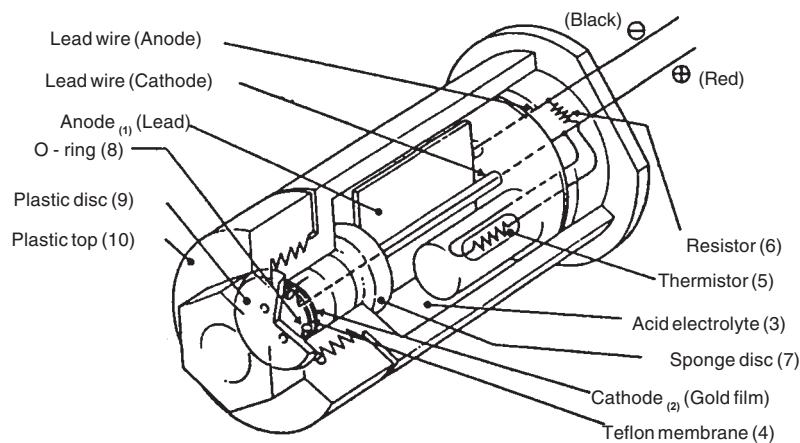
- 1 Permanent magnet
- 2 Platinum wire
- 3 Mirror
- 4 Quartz spheres
- 5 Wire loop
- 6 Photodetector
- 7 Light source
- 8 Amplifier
- 9 Display

## MEASURING PRINCIPLE

### OXYGEN MEASUREMENT (EO<sub>2</sub> ELECTROCHEMICAL PRINCIPLE)

#### 2.2.2 Electrochemical Measurement

The determination of O<sub>2</sub> concentrations is based on the principle of a galvanic cell. The principle structure of the oxygen sensor is shown in Fig. 2-5.



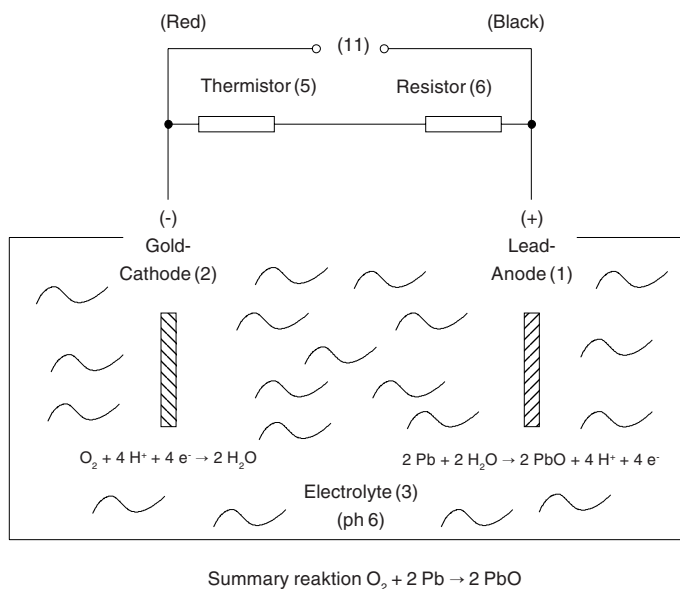
**Fig. 2-5: Structure of electrochemical Oxygen Sensor**

The oxygen sensor incorporates a lead/gold oxygen cell with a lead anode (1) and a gold cathode (2), using a specific acid electrolyte. To avoid moisture losses at the gold electrode a sponge sheet is inserted on the purged side.

Oxygen molecules diffuse through a non-porous Teflon membrane (4) into the electrochemical cell and are reduced at the gold-cathode. Water results from this reaction.

On the anode lead oxide is formed which is transferred into the electrolyte. The lead anode is regenerated continuously and the electrode potential therefore remains unchanged for a long time.

The rate of diffusion and so the response time ( $t_{90}$ ) of the sensor is dependent on the thickness of the Teflon membrane.



**Fig. 2-6: Reaction of galvanic cell**

The electric current between the electrodes is proportional to the O<sub>2</sub> concentration in the gas mixture to be measured. The signals are measured as terminal voltages of the resistor (6) and the thermistor (5) for temperature compensation.

The change in output voltages (mV) of the sensor (11) represents the oxygen concentration.

**Note !**

Depending on measuring principle the electrochemical O<sub>2</sub> cell needs a minimum internal consumption of oxygen (residual humidity avoids drying of the cell). Supply cells continuously with dry sample gas of low grade oxygen concentration or with oxygen-free sample gas could result a reversible detuning of O<sub>2</sub> sensitivity. The output signal will become instabil.

For correct measurement the cells have to be supplied with O<sub>2</sub> concentrations of at least 0.1 Vol.-%. We recommend to use the cells in intervall measurement (purge cells with conditioned (dust removal but no drying) ambient air during measurement breaks).

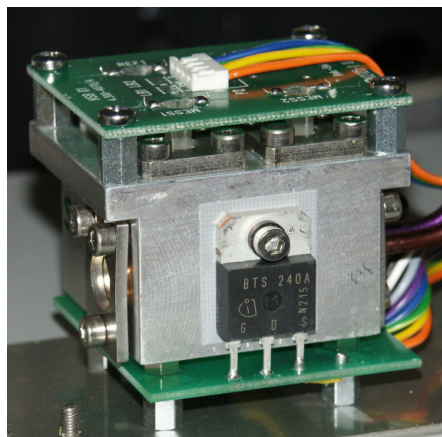
If it is necessary to interrupt oxygen supply for several hours or days, the cell has to regenerate (supply cell for about one day with ambient air). Temporary flushing with nitrogen (N<sub>2</sub>) for less than 1 h (e.g. analyzer zeroing) will have no influence to measuring value.

## 2.3 Thermal Conductivity Measurement

To measure gases like Hydrogen (H<sub>2</sub>), Argon (Ar) or Helium (He), the measurement method of thermal conductivity (TC) will be used.

### 2.3.1 Sensor Design

The sensor consists of four small PT 100 resistors arranged in a Wheatstone Bridge which is mounted into a block made of either aluminum, stainless steel or hastelloy, depending on the application (e.g. stainless steel / hastelloy for corrosive gases). The block is thermostatted to suppress influence of external temperature change.



*Fig. 2-7: Thermal conductivity sensor*

### 2.3.2 Analysis Cell

Both the volume of the block and the mass of the resistors have been minimized on order to obtain short response time.

The block contains two gas paths for sample and reference gas, whereat the reference gas path is closed for standard applications. Always two sensors are located in the sample and the reference gas path. The resistors are full glass packaged to withstand aggressive gases. The material in contact with the gases are glass, Gold, Aluminum, stainless steel and Hastelloy, so a high resistance against corrosion by aggressive gases is provided by this cell.

### **2.3.3 Measurement Method**

The entire measurement cell is thermostatted to a temperature of up to 75 °C. The four sensors are electrically heated to a higher temperature and the signal of the Wheatstone Bridge is monitored. Depending on the thermal conductivity of the gases that pass the cell, the temperature of the sensors in contact with the gas changes and thus their electrical resistance. This changes the output signal of the Wheatstone Bridge and electronic circuitry processes this signal to obtain standardized signal amplitudes, and transmits these to both an indicator instrument and to the signal output connector.

## **MEASURING PRINCIPLE**

### **THERMAL CONDUCTIVITY (TC) MEASUREMENT**

### 3. Photometer Assembly

Depending on gas component and measuring range, different photometer assemblies will be realized in 100 series.

Optional the photometer can be sealed to ambient air. In this case all parts are sealed with O-rings. The entire photometer assembly is mounted as a unit on the main circuit board (BKS) by means of a bracket. The main circuit board is inserted into guide rails in the analyzer housing, to which the front panel (membrane keypad) and the rear panel are assembled.

#### 3.1 Photometer with Pyroelectrical Detector (Solid-state detector)

Fig. 3-1 shows the schematical photometer assembly for dual channel operation.

The base element for the photometer assembly is the chopper housing (03), upon which the light source (thermal radiator, 07), the analysis cell (cuvette, 09), and the signal detection unit [filter cell (14/15), pyroelectrical (solid-state) detector with integrated preamplifier (16)] are all mounted.

The chopper housing also incorporates the duplex filters (04/05) for the selection of spectral band-pass ranges from the broadband emission of the light sources.

Between the two halves of the chopper housing (03), which are sealed together with an O-ring, is the chopper blade, driven by a stepping motor. Both the chopper housing and the motor encapsulation are hermetically sealed with respect to the ambient in order to prevent entry of gases, such as atmospheric CO<sub>2</sub>, which could produce background absorptivity (preabsorption) leading to drift effects. An absorber material provides for constant removal of any traces of CO<sub>2</sub> which may enter the interior of the chopper housing via diffusion.

The chopper housing additionally incorporates a photoelectric gate for providing a reference signal for the phase angle of the chopper blade, plus a temperature sensor (28) for monitoring continuously the photometer assembly temperature. This temperature information is used by the signal processing electronics for the compensation of thermal effects.

The analysis cells are merely aluminum tubes equipped with sample gas inlet and outlet fittings.

This extremely simple and windowless design enables easy cleaning of the cells in the event of contamination.

The only optical surfaces which also might become contaminated are the chopper windows and the windows of the filter cells; these are accessible upon removal of the cell body.

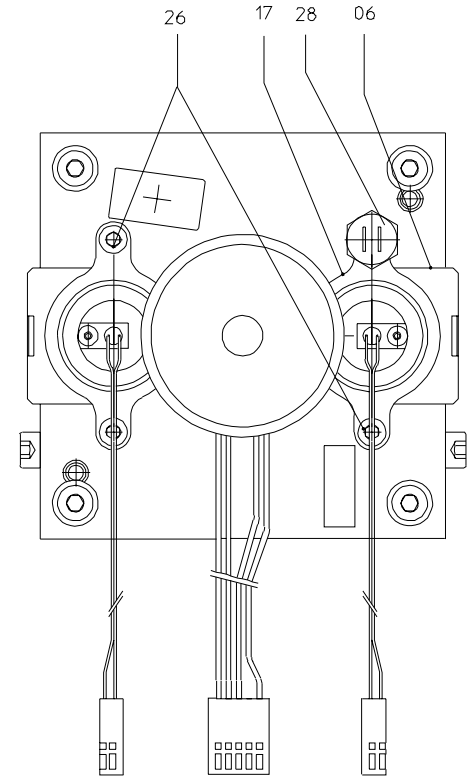
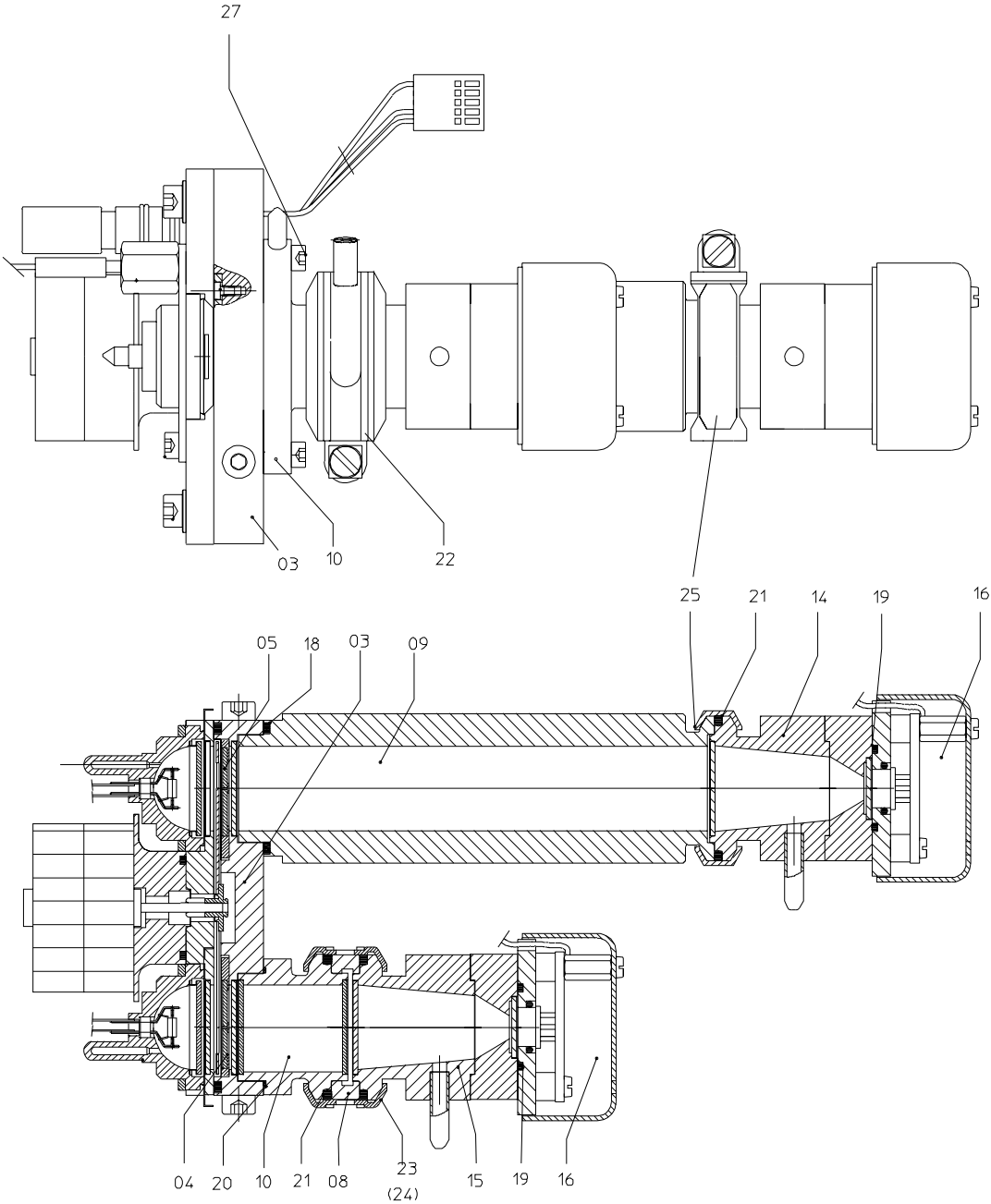
The filter cell (14/15) has a necked conical shape for optimal adaptation of the analysis cell beam cross - sectional profile to the active area of the detectors.

For high measurement ranges (up to 100 %), an adapter cell (10) is required.

The use of a spacer ring (08) creates an analysis cell in the space between the exit window of the adapter cell and the entrance window of the filter cell.



**Fig. 3-1: Photometer Assembly with Pyroelectrical Detector**



**Legends:**

- 03 Chopper Housing
- 04 / 05 Duplex Filter Disc
- 06 Zero - Adjustment Baffle (not for sealed photometer)
- 07 Light Source (thermal radiator)
- 08 Analysis Cell 1 - 7 mm (spacer ring)
- 09 Analysis Cell 50 - 200 mm
- 10 Adapter Cell
- 14/15 Filter Cell
- 16 Detector
- 17 Flange (light source)
- 18-21 O - Rings
- 22 Clamp (analysis cells 1-7 mm)
- 23 (24) Clamping Collar (analysis cells 1-7 mm)
- 25 Clamp (analysis cells 10-200 mm)
- 26 Light Source Mounting Screws
- 27 Mounting Screws for Analysis Cells/Adapter Cells
- 28 Temperature Sensor

### 3.2 Photometer with Gas Detector

Fig. 3-2 shows schematically the photometer assembly.

This assembly is similar to the assembly with pyroelectrical detector.

The analysis cells are separated into two halves by means of an internal wall along its axis and both ends are sealed with windows. This divided the analysis cell in measuring side and reference side.

Sample gas is flowing through measuring side while the closed reference side contains inert gas ( $N_2$ ).

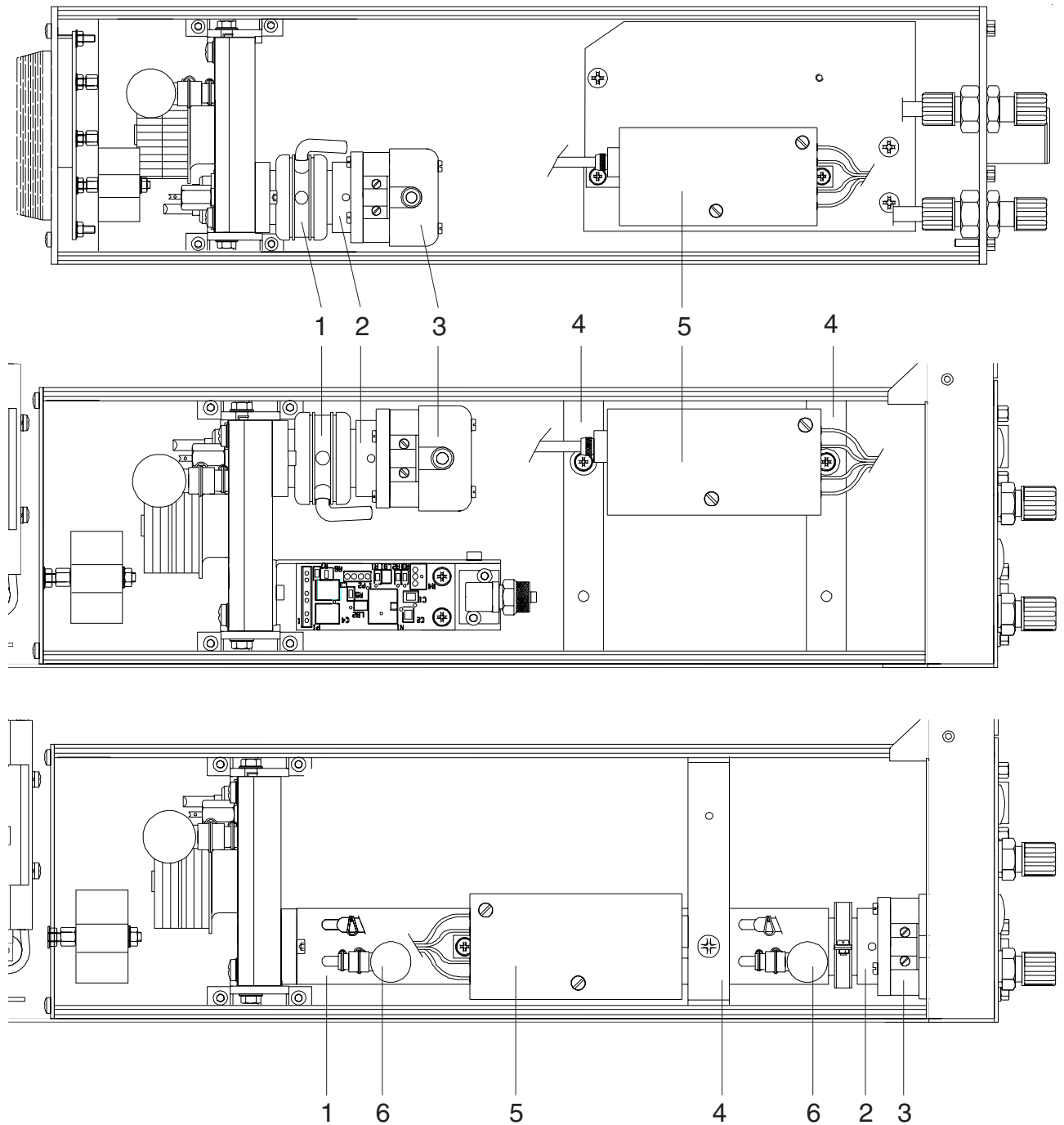
To prevent measuring errors by preabsorption, two absorber, fitted to the gas connections of the reference side, absorb  $CO_2$  parts.

The filter cell has a single stage conical shape.

The gas detector is connected by a shielded cable to the separate preamplifier.

For small measuring ranges the preamplifier is mounted at the analysis cell.

For high measuring ranges the preamplifier is mounted at two holding clamps.



**Fig. 3-2: Photometer Assembly 100 Series with Gas Detector**  
[example above and middle: **high** measuring ranges,  
example below: **small** measuring ranges.]

- 1 Analysis Cell
- 2 Filter Cell
- 3 Gas Detector
- 4 Holding Device
- 5 Preamplifier
- 6 Absorber



## 5. Preparation of Start-up

Please check the package and its contents immediately upon receipt.

If any item is damaged or lost you are requested to notify the contractor to undertake a damage survey and report the loss or damage to us immediately.



**BINOS® 100 F:**

Unscrew transfer safety lock of photometer sliding carriage (Fig. 5-1)!

Lock the system during transport !



*Fig. 5-1: BINOS® 100 F, Photometer safety lock*

### 5.1 Installation Site



The analyzers must not operate in explosive atmosphere without supplementary protective measures !



Free flow of air into and out of the analyzers (ventilation slits) must not be hindered by nearby objects or walls !



Operate analyzer as table-top version or as rack-mountable version (built-in) only (except of BINOS® 100 F: designed for wall mounting only) !

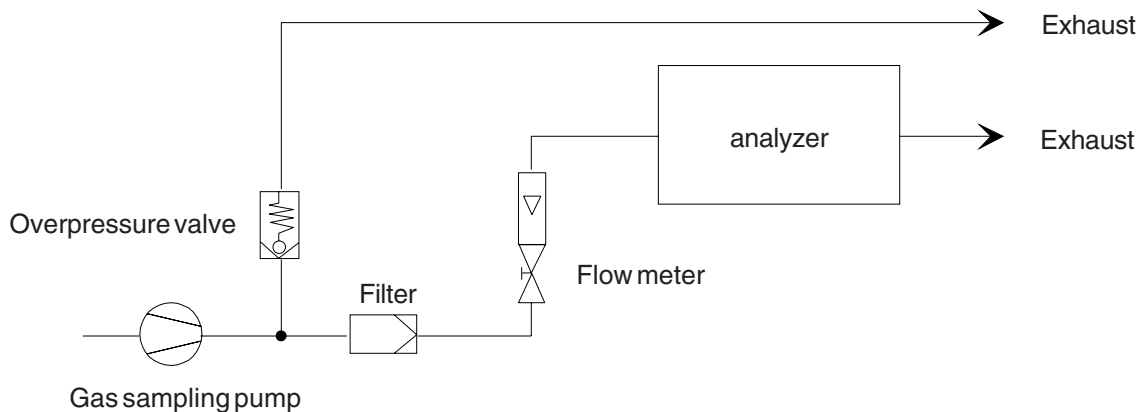
The installation site for the analyzers has to be dry and remain above freezing point at all times. The analyzers must be exposed neither to direct sunlight nor to strong sources of heat.



Be sure to observe the permissible ambient temperatures (c.f. chapter 27: Technical Data). For outdoor installation, we recommend to install the analyzers in a protective cabinet. At least, the analyzers has to be protected against rain (e.g., shelter).

The BINOS 100 series analyzer has to be installed **as near as possible to the sample point**, in order to avoid low response time caused by long sample gas lines.

In order to decrease the response time, a sample gas pump with a matching high pumping rate may be used, while the analyzers has to be operated in the bypass mode or by an overflow valve to prevent too high flow and too high pressure (Fig. 5-2).



**Fig. 5-2: 100 series, Bypass installation**

## 5.2 Gas Conditioning (Sample Handling)

The conditioning of the sample gas is of greatest importance for the successful operation of any analyzer according to extractive method.



All gases have to be supplied to the analyzers as conditioned gases !  
If corrosive gases are inserted into the instrument, it has to be verified that there are no gas components which may damage the gas path components.

The gas has to fulfill the following conditions:

It must

- be free of condensable constituents
- be free of dust
- be free of aggressive constituents which are not compatible with the material of the gas paths.
- have temperatures and pressures which are within the specifications stated in "Technical Data" of this manual.



Inflammable or explosive gas mixtures may not be introduced into the analyzers without supplementary protective measures !

When analysing vapours, the dewpoint of the sample gas has to be at least 10 °C below the ambient temperature in order to avoid the precipitation of condensate in the gas paths.

Suitable gas conditioning hardware may be supplied or recommended for specific analytical problems and operating conditions.

### 5.2.1 Fine Dust Filter (Option BINOS® 100 2M/F)

A fine dust filter with a pore size of 2 µm may optionally be integrated into the BINOS® 100 2M/F front panel (Fig. 1-2, Item 10, not for 2 channel analyzers with parallel gas paths and for BINOS® 100 F analyzers used in hazardous area (Ex zones)).

### 5.2.2 Gas Sampling Pump (Option BINOS® 100 2M/F)

Optional BINOS® 100 2M/F can be equipped with a gas sampling pump (pumping rate max. 2.5 l/min., see chapter 7.4). For special solutions with 2 parallel measuring channels and 2 gas sampling pumps consult factory.



Lifetime max. 5,000 hours of operation !

### 5.2.3 Pressure Sensor (Option)

It is possible to integrate a pressure sensor with a range of 800 - 1,100 hPa.

The concentration values computed by the analyzer will then be corrected to reflect the barometric pressure to eliminate faulty measurements due to changes in barometric pressure (see technical data, chapter 27.).

### 5.2.4 Gas Flow

The gas flow rate should be within the range 0.2 l/min to max. 1.5 l/min !

A constant flow rate of about 1 l/min is recommended.



The allowed gas flow rate for analyzers with paramagnetic oxygen sensor and for BINOS® 100 F analyzers used in hazardous area (Ex zones) is max. 1.0 l/min!

BINOS® 100 2M/F with an optional fine dust filter (see chapter 5.2.1) allow to adjust the flow with a screw driver via an optional integrated throttle.

It is possible to integrate up to two flow indicators into the BINOS® 100 2M/F front panel (Fig. 1-2 to 1-4).



### 5.3 Gas Connections

The installed gas connections are depending on gas analyzer specification and model. All fittings are clearly marked.

The fittings are located on the rear panel of the instrument or on the left bottom side.



The exhaust gas lines have to be mounted in a declining, pressureless and frost-free way and according to the valid emission legislation !



Do not interchange gas inlets and gas outlets !



Ensure that all gas connections are made as labeled and are leak free !

Improper gas connections could result in explosion and death !

The unit's exhaust may contain hydrocarbons and other toxic gases such as carbon monoxide ! Carbon monoxide is highly toxic !



Permissible gas pressure max. 1,500 hPa !

#### 5.3.1 Standard Configuration

Depending on analyzer version the following gas connections are installed:

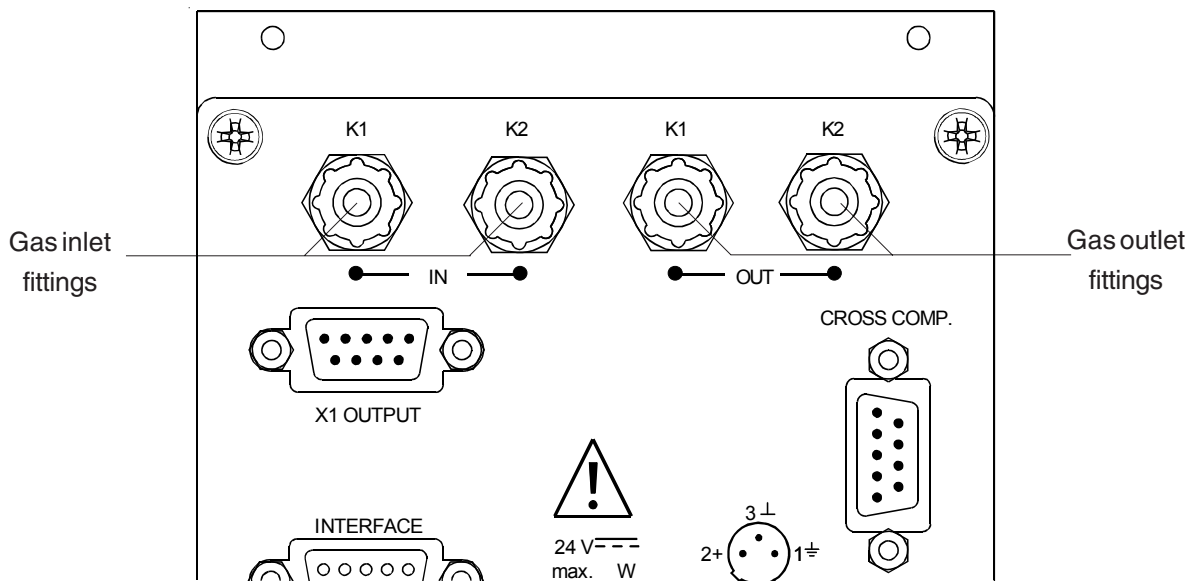
in = Gas inlet	out = Gas outlet
K 1 = measuring channel 1	K 2 = measuring channel 2 *)

Zero gas and span gas are introduced directly via the sample gas inlet. The test gas containers have to be set up according to the current legislation.

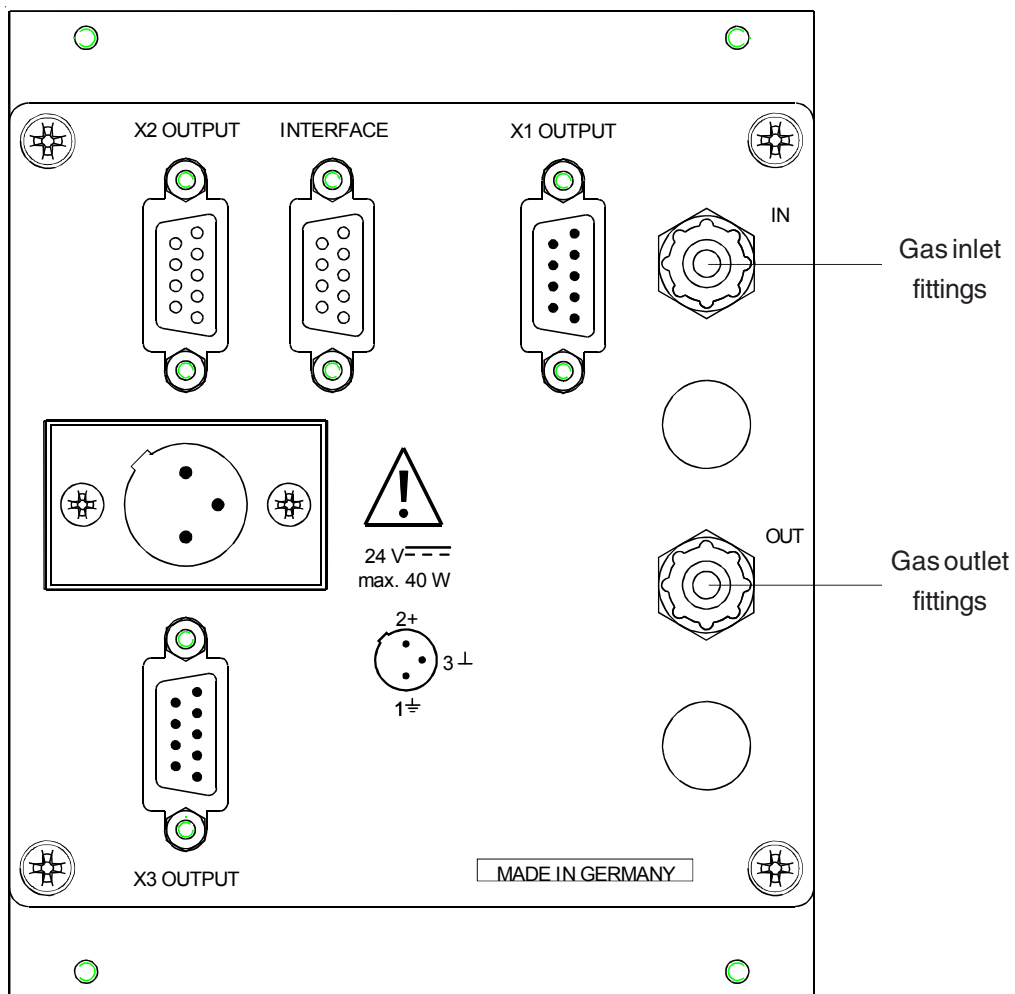


Be sure to observe the safety regulations for the respective gases (sample gas and test gases / span gases) and the gas bottles !

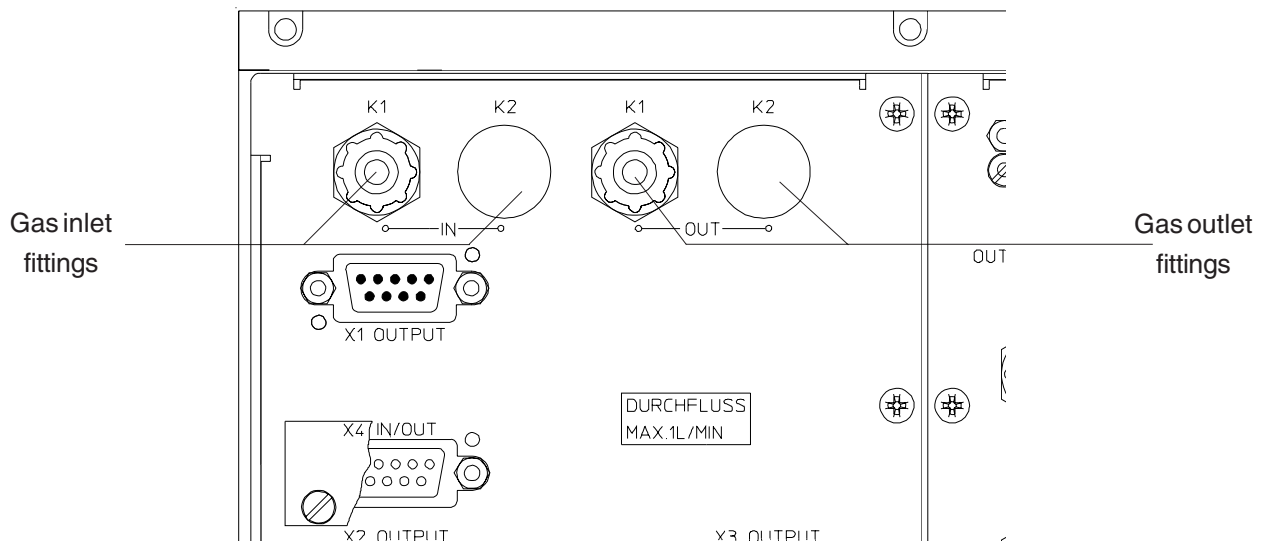
\*) for HYDROS® 100 with open reference side of sensor the gas fittings of channel 2 are used to connect the reference gas.



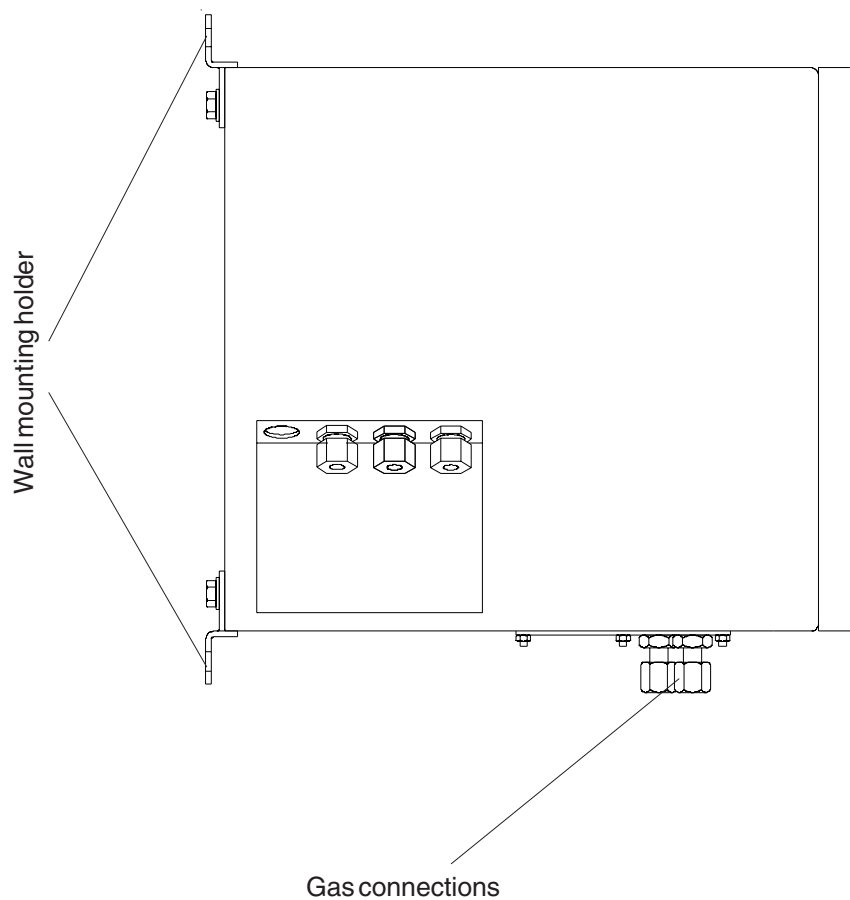
**Fig. 5-3a: BINOS® 100 (M), OXYNOS® 100 (EO<sub>2</sub>), HYDROS® 100, gas connections**



**Fig. 5-3b: OXYNOS® 100 (PO<sub>2</sub>), gas connections**



**Fig. 5-3c: BINOS® 100 2M, standard gas connections**



**Fig. 5-3d: BINOS® 100 F, standard gas connections**

### 5.3.2 Internal Solenoid Valves (BINOS® 100 2M/F Option)

For operation with optional internal solenoid valves, the following indications have to be considered:

All necessary gases have to be connected at the corresponding solenoid valve at an overpressure of 50 - max. 500 hPa.

For 2 channel analyzer with parallel gas paths we can deliver a special solution with 2 valve blocks.



Be sure to observe the safety regulations for the respective gases (sample gas and test gases / span gases) and the gas bottles !  
The test gas containers have to be set up according to the valid regulations.

If a solenoid valve is open there is illuminated a green LED (Fig. 1-2, Item 3) at the front panel.

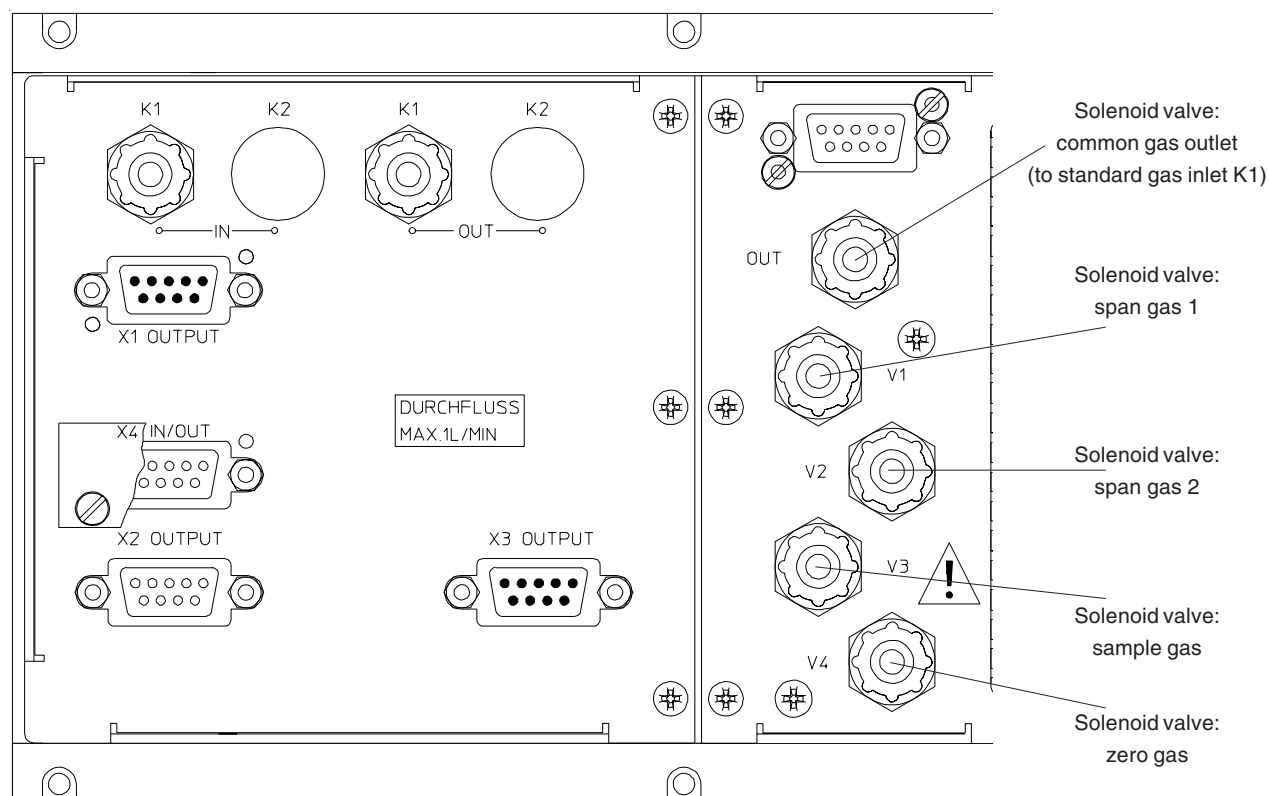
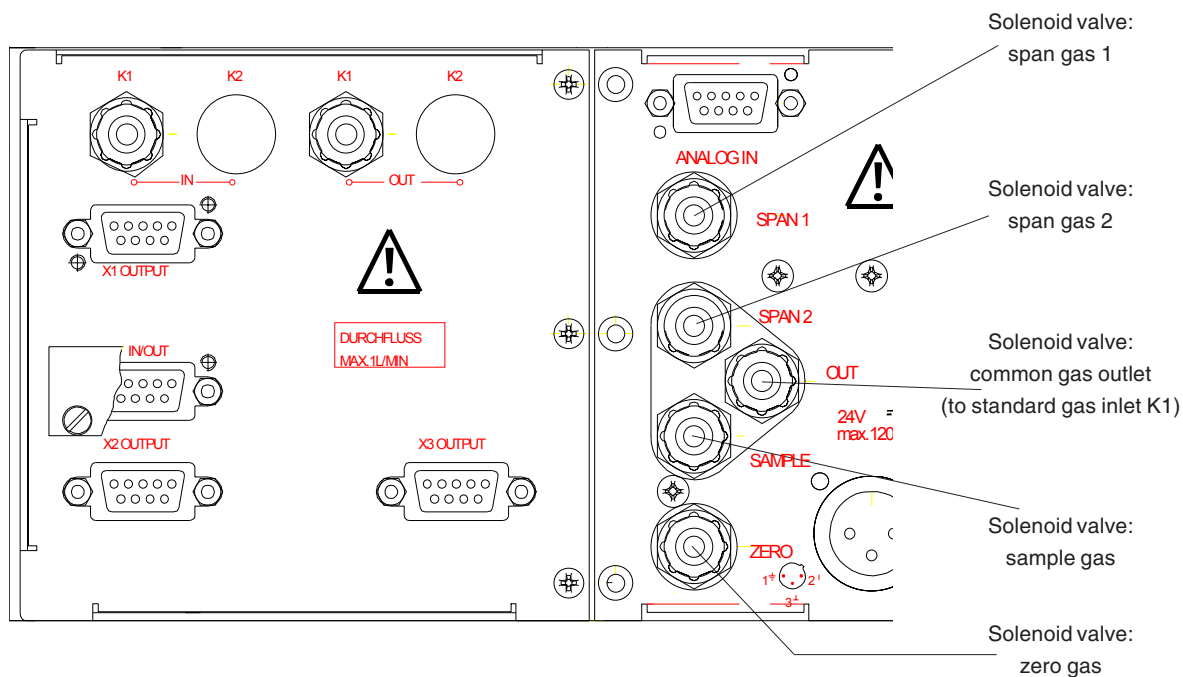
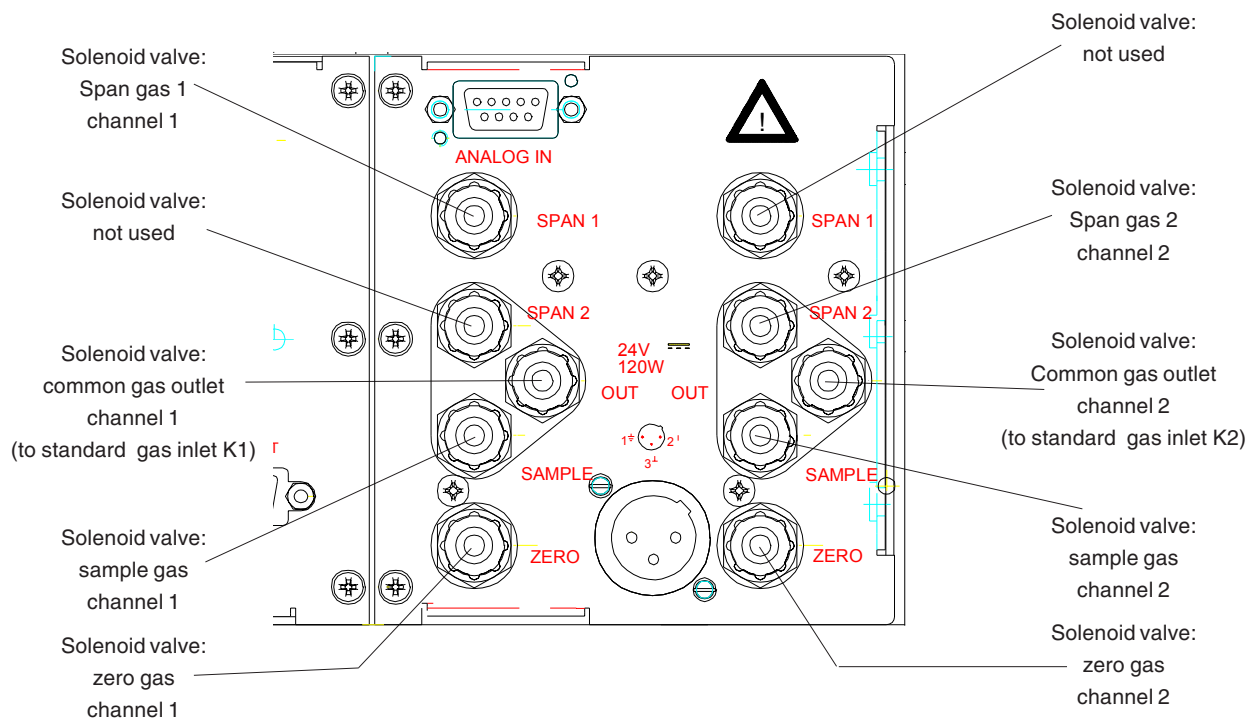


Fig. 5-4a: BINOS® 100 2M (version A), gas connections with solenoid valve option



**Fig. 5-4b: BINOS® 100 2M (version B), gas connections with solenoid valve option**



**Fig. 5-4c: BINOS® 100 2M (special version), gas connections with 2 solenoid valve blocks**

### 5.3.3 Purge gas connection of BINOS® 100 F for Ex zones

a) **ATEX Applications**



Refer to the supplemental manual for installing analyzers in hazardous areas where ATEX is applicable.

b) **Z purge for CSA-C/US Ex Zone 2 Non-Flammable Atmospheres**



This analyzer is not designed for analysis of flammable sample !

Introduction of flammable samples into this equipment could result in explosion, causing severe personal injury, death or property damage !

Consult factory if flammable samples are to be measured !

Z Purge kit is designed for protection against the invasion of flammable gases into enclosure from outside atmosphere only. It does not provide protection against the release of inflammable gases contained in the sample gas via internal leakages.

- Connect purge gas (air or N<sub>2</sub>) to the BINOS® 100 F inlet via 1/4" O.D. tube connection (see Fig. 27-4) !  
Outlet is done via 3/8" O.D. fitting with analyzer specific insert throttle.
- Use purge gas supply under pressure of 58 psig (4 bar; 5,000 hPa abs.).  
This will provide a flow rate approx. 55 scfh (26 l/min.). At this flow rate, five case volumes of purge gas will pass through the instrument in 11 minutes.

After 11 minutes, reduce the pressure to 5.1 psig (350 mbar; 1,350 hPa abs.), resulting in a flow rate of approx. 18 scfh (8.5 l/min.). This will provide an enclosure over-pressure of approx. 0.24 inch H<sub>2</sub>O (0.6 hPa) for continuous purge.



Pressure inside the housing must not exceed 5 hPa at normal operation or 10 hPa for a short time of less than 1/2 hour resp. !

#### 5.4 Additional Hints to BINOS® 100 F (Field Housing)

In the field housing version BINOS® 100 F all components are incorporated into a protection housing going conform to DIN-standard protection class IP 65 (approx. NEMA 4/4X). This housing is designed for wall mounting.

For installation in hazardous areas the BINOS® 100 F is equipped with an impact tested front panel (according to CENELEC, EN 50014) with touch screen keypad. Optionally we can provide additional intrinsically safe I/O's and/or ex interface relays (couplers). For European ex zone 2 a simplified pressurization is installed and individual approval is provided. An EExp approved "purge system" for European ex zone 1 (both according to CENELEC, EN 50016) or with Z Purge for measurement of non-flammable gases in hazardous areas (according to CSA-C/US for North American Ex zone 2) is another option.



Be sure to observe the additional notes, safety precautions and warnings given in the individual manuals (simplified pressurization for ex zone 2 / EExp approved "purge system" for ex zone 1) and in section "Safety Summary, subsection VII.!

### 5.4.1 Wall Mounting

This housing is designed for wall mounting.

Location of fixing points: see Fig. 5-5.



Lift or carry housing with at least 2 persons because of the high weight of field housing BINOS® 100 F (approx. 30 - 35 kg for standard housing).

For easy transport use a suitable cart.



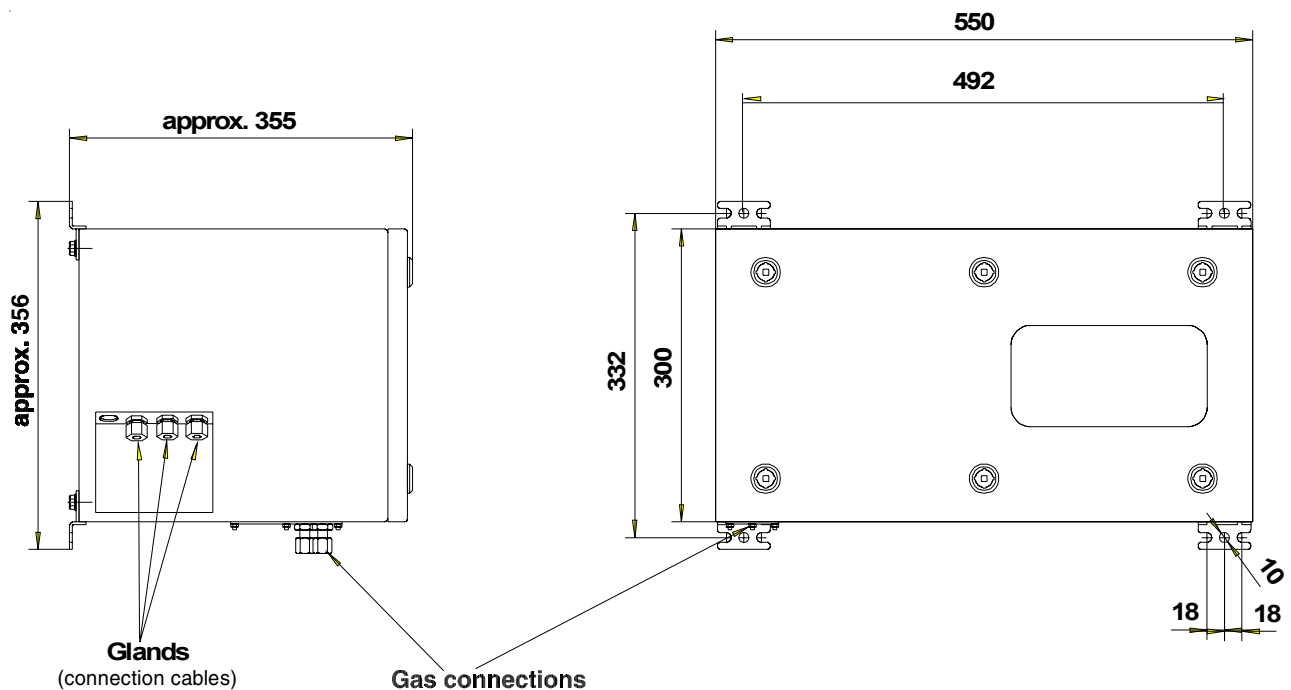
Lift points are labeled ! Labels showing down side for transport !

Do not use electronics of optional “purge system” as handle !



Take care to use anchors and bolts specified to be used for the weight of the units!

Take care the wall the unit is intended to be installed at is solid and stable to hold the units!



**Fig. 5-5: Dimensional sketch / Drill drawing BINOS® 100 F Standard version**

*[all dimensions in mm]*



**5.4.2 Electrical Connections**



Be sure to observe the safety precautions and warnings !



Verify, that the cable glands together with installed cables are hermetic to ensure protection class IP 65 (according to IEC 60529).  
The permissible outside diameters of the cables are 7 to 12 mm !

**a) Mains Supply**

The analyzer is rated for an operating voltage of 230 V AC or 120 V AC, 47-63 Hz. The built-in power supply is either of type SL5 or of type SL10 and provides a switch to manually select the nominal voltage.

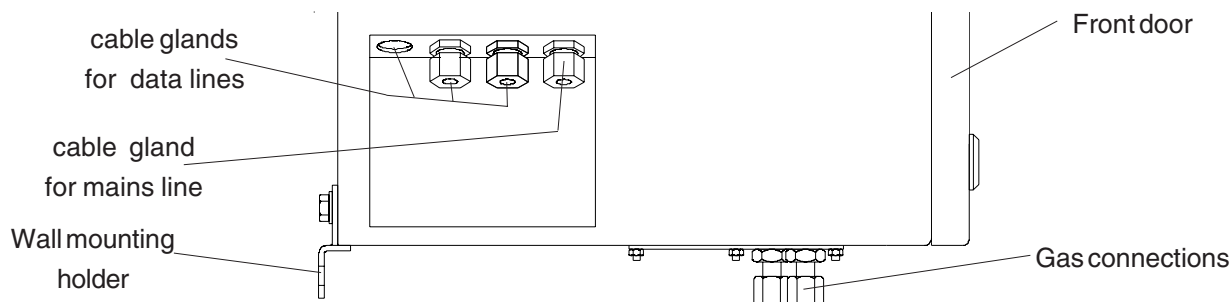
- Open the analyzers front door.
- Insert the mains line through the cable glands (Fig. 5-6 or 5-5) into the housing. Connect L , N and PE to the terminals located nearby the powerline filter (Fig. 5-8).



Verify that the line voltage given on the identification plate (front door inside) complies with that of your power supply line !  
Verify that the position of the power supply's voltage selector switch complies with the voltage of your power supply line (Fig. 27-7, 27-8 and 5-8) !



The BINOS® 100 F (field housing) has no switch with disconnect function. The customer has to provide a switch or circuit breaker into his installation. This switch has to be installed near by analyzer, must be easily attainable for operator and has to be characterized as disconnecter for analyzer.



**Fig. 5-6: BINOS® 100 F, cable glands for lines (side view from left)**

**b) Optional Signal Lines**

This are analog outputs, digital inputs/outputs and serial interfaces.

- Open the analyzer's front door.
- Insert the cable through the cable glands (Fig. 5-6 and 5-5) into the housing. Connection is to be done to the respective terminal strips (Fig. 5-7 and 5-8). Assignment see chapter 2.



Cables to external dataprocessing have to be double-insulated against mains voltage for analyzer BINOS® 100 F !



Use only shielded cables for signal lines! To ensure proper electromagnetic compatibility (EMC) it is recommended to follow the installation steps given below.



All unused cable glands need to be sealed using a sealing plug (part no. ETC00791 or similiar)  
 Unused cable gland openings in the enclosure need to be covered using a special screw (part no. ETC 000790 or similiar).

**Cable Gland Assembly Instruction for Shielded Cables**



1. Strip the cable insulation
2. Uncover the shielding



3. Feed cable through gland nut and into fixing element



4. Put the shielding net over the element the way that it covers the o-ring 2 mm.



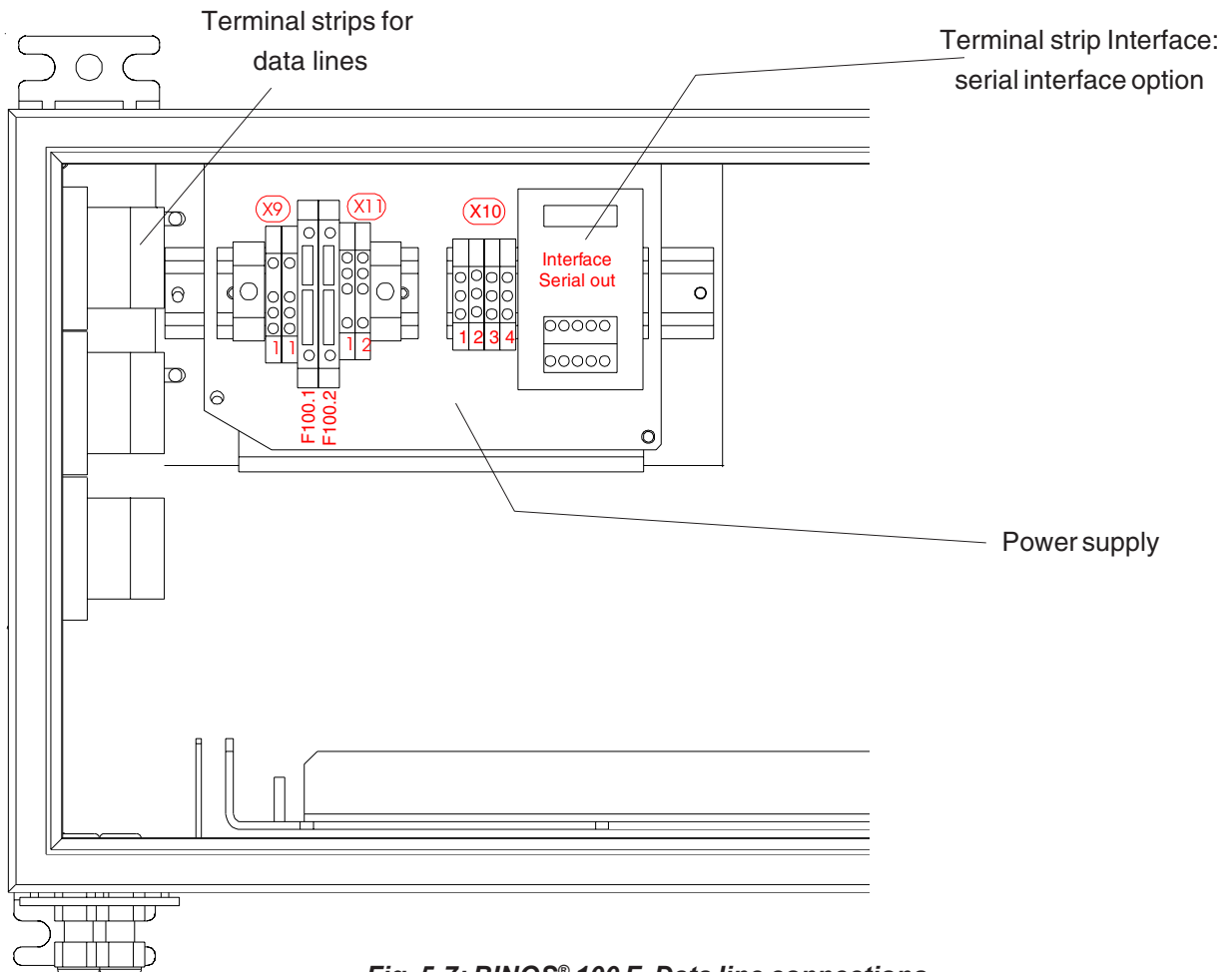
5. Stick the fixing element into the neck and fix the gland.



**ETC00791**  
Cable gland sealing plug



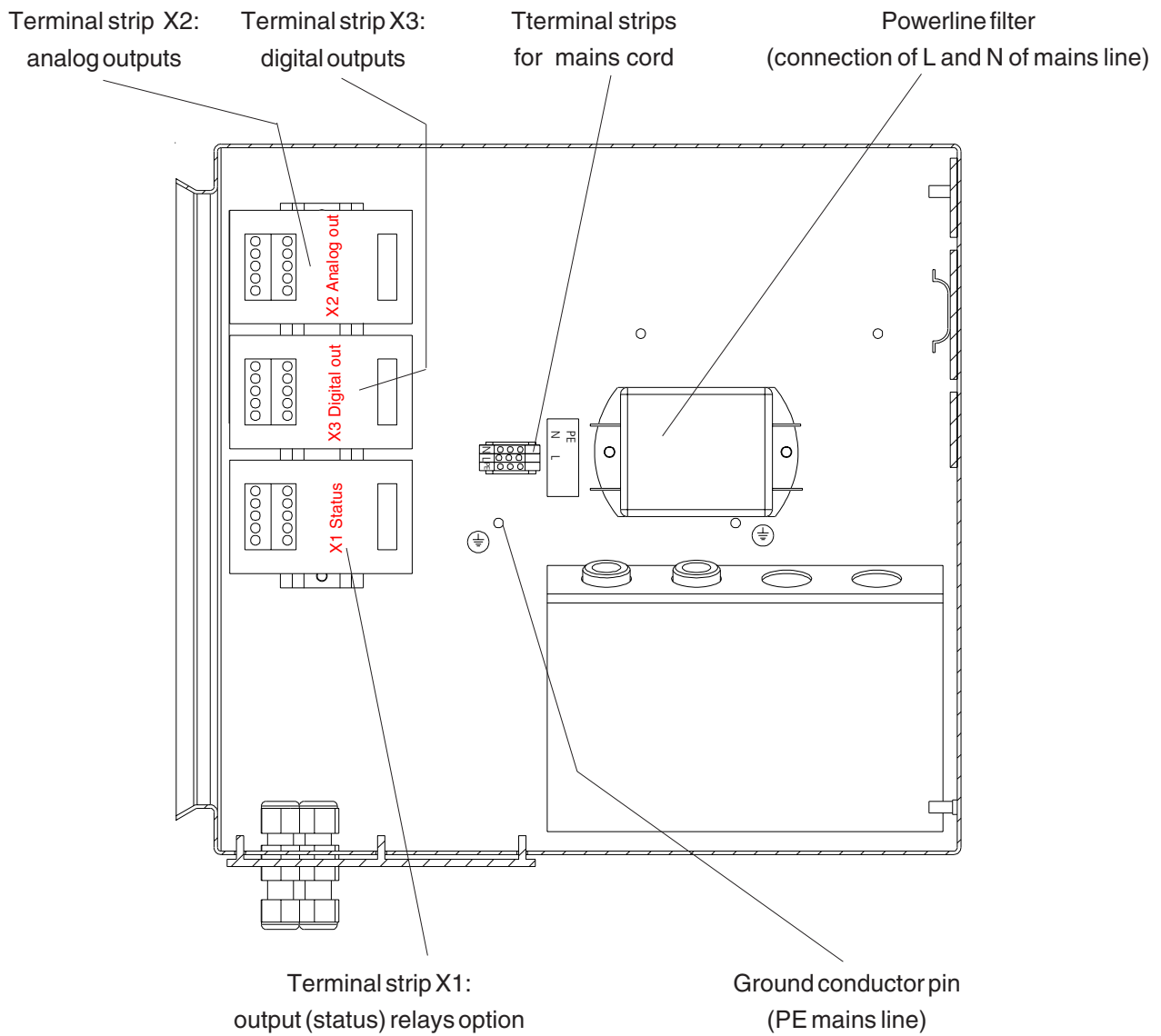
**ETC00790**  
Cable gland allen screw sealing plug



**Fig. 5-7: BINOS® 100 F, Data line connections**  
*Inside view from front (detail, without front door)*

## PREPARATION

### ADDITIONAL HINTS TO BINOS® 100 F (FIELD HOUSING)



**Fig. 5-8: BINOS® 100 F, Connection data lines / mains line**  
(inside view, left side panel)

## 6. Switching On

### 6.1 General

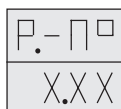


Be sure to observe the safety precautions and warnings !

Once the instrument has been correctly assembled and installed in accordance with the general instructions given in section 5., the equipment is ready for operation.

The equipment is switched on by providing the required voltage.

The presence of the supply voltage will be indicated by the illumination of the LED displays. Upon connection of the supply voltage, the analyzer will perform a self diagnostic test routine. First the actual program version will be shown.



(analyzers without fieldbus)

or



(analyzers with fieldbus)

Finally either concentration values or error messages will be displayed

If as a result of a battery fault the default values were charged, this will be shown by a flashing "**batt.**"

This message will disappear after depressing any key.



Analyzer warming-up takes about 15 to 50 minutes, depending on the installed detectors !

Before starting an analysis, however, the following should be performed:

- entry of the desired system parameters,
- calibration of the analyzer.

#### Note:

The "X's" shown in the display indicate a number or combinations of numbers.

## 6.2 24 V DC Supply

The analyzers of series 100 (with except of BINOS® 100 F and BINOS® 100 2M with internal power supply) are specified for an operating voltage of 24 V DC. This voltage has to be provided via a 3-pole XLR flange (male).

The DC supply voltage has to be provided by one of the optional power supplies VSE 2000, UPS 01 T, DP 157, SL5, SL10 or an equivalent power supply.

- Connect power supply and analyzer (Fig. 6-1, Plug 24 V DC).



Verify correct polarity before operation (Fig. 29-1)!

- Connect mains line and power supply.



Be sure to observe the safety precautions and warnings given by manufacturer of power supply !

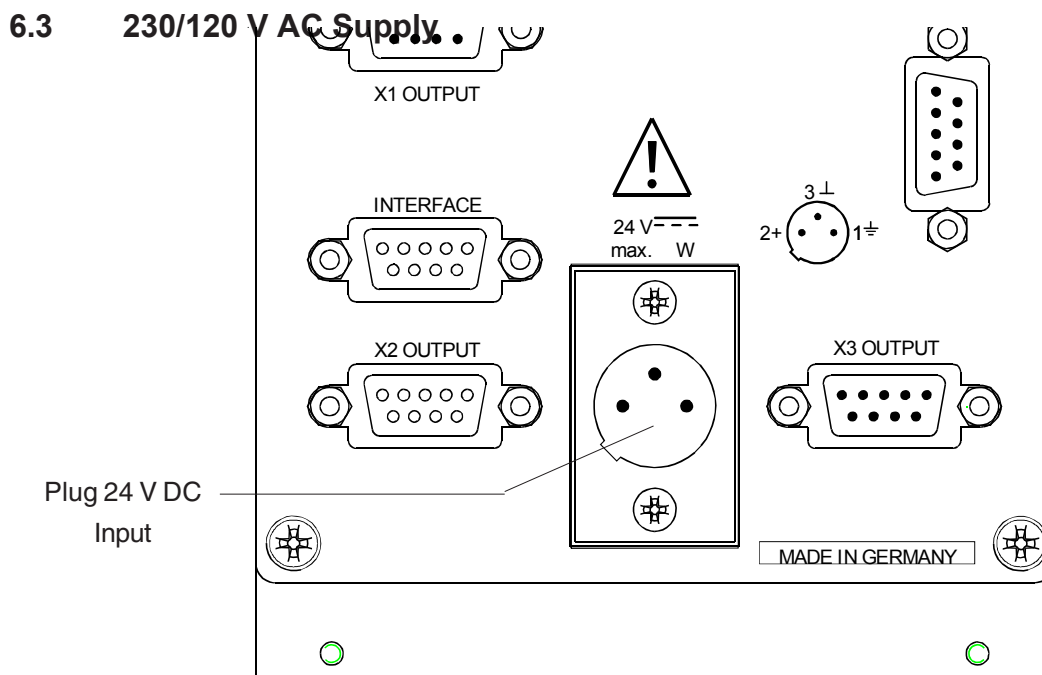


Fig. 6-1a: BINOS® 100 (M), OXYNOS® 100 (EO<sub>2</sub>), HYDROS® 100, Voltage supply

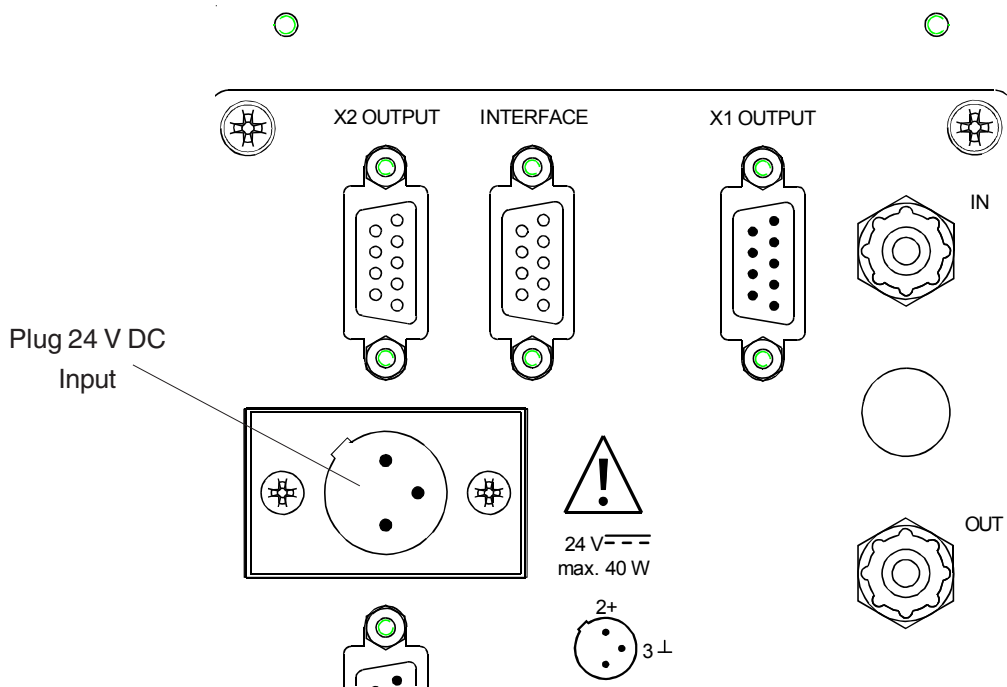


Fig. 6-1b: OXYNOS® 100 (PO<sub>2</sub>), Voltage supply

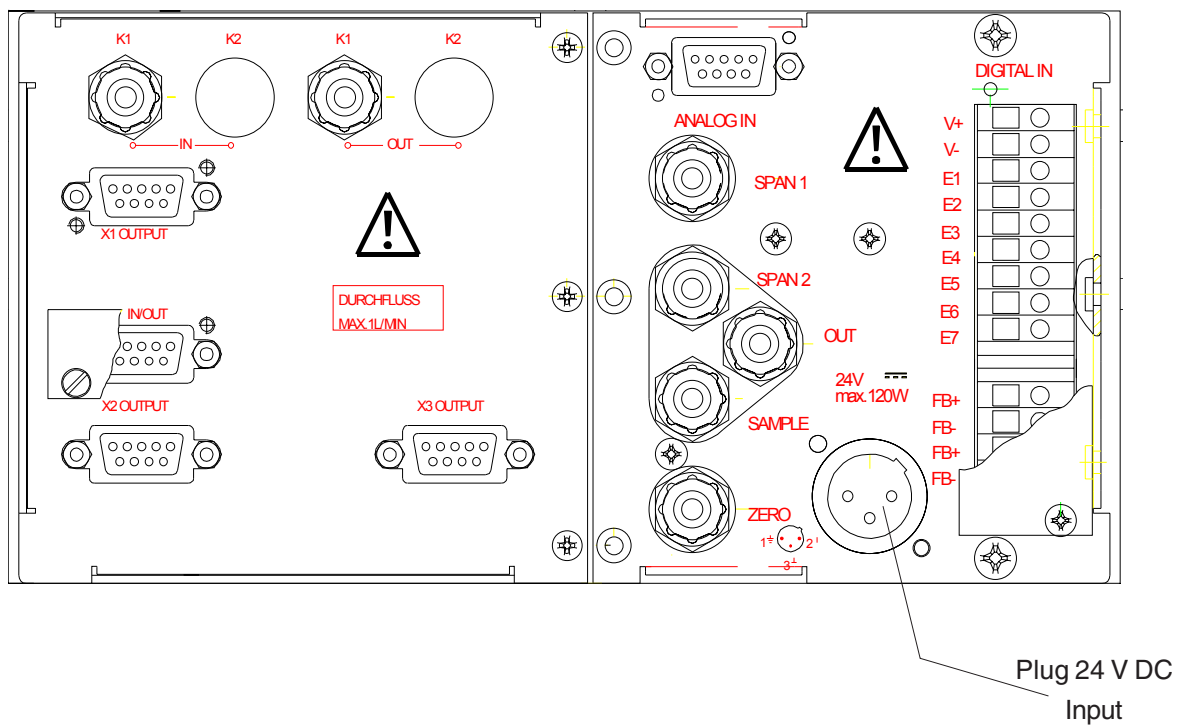


Fig. 6-1c: BINOS® 100 2M (version B) with external power supply, Voltage supply

### 6.3.1 BINOS® 100 2M

The analyzer BINOS® 100 2M is optionally equipped with an internal “autoranging” power supply and is specified for an operating voltage of 230 V AC or 120 V AC resp., 47-63 Hz.

For supply of external components/analyzers there is built in a 24 VDC outlet (a 3-pole XLR flange, female, max. 2 A).

- Connect internal power supply and external components (Fig. 6-2, 24 V DC out).



24 VDC supply to external components/analyzers with the internal power supply of BINOS® 100 2M requires a fuse to be connected in series to the consumer which limits the current consumption to max. 2 A !



Verify correct polarity for 24 V DC supply to external components before operation (Section 29.) !

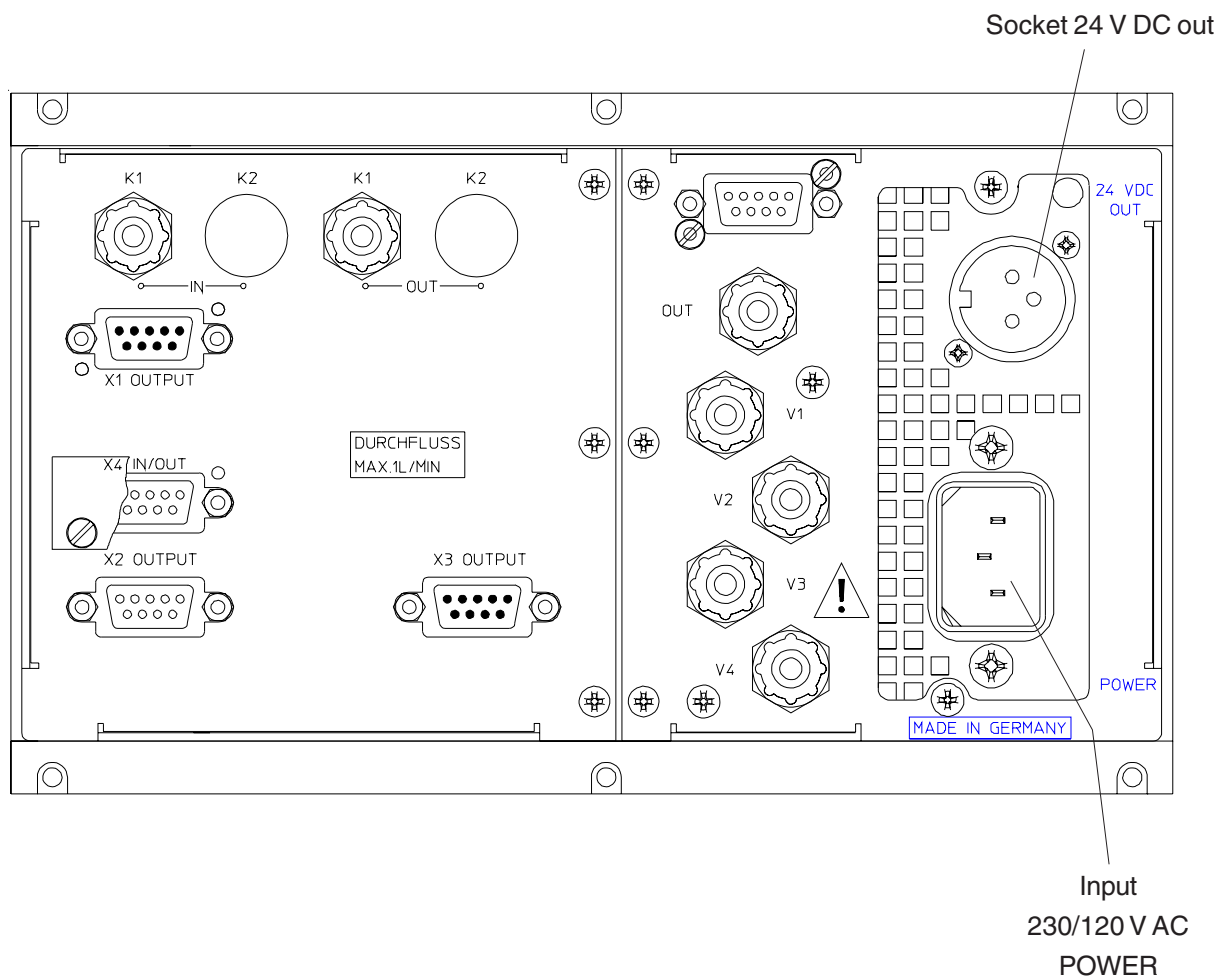
- Connect mains line and internal power supply (Fig. 6-2, V AC in).



Verify beforehand that the line voltage stated on the power supply meets that of your power supply line !

The socket outlet shall be installed near the equipment.





**Fig. 6-2: BINOS® 100 2M (version A) shown with internal power supply, Voltage supply**

### 6.3.2 BINOS® 100 F

The analyzer is specified for an operating voltage of 230 V AC or 120 V AC resp., 47-63 Hz.. Built-in power supply (manual switch between 230/120 VAC) is either power supply of type SL5 or of type SL10.

Once the instrument has been correctly assembled and installed in accordance with the general instructions given in section 5., 5.3.3 and 5.4, the equipment is ready for operation.

The analyzer is switched on by providing the required voltage.



## 7. Key Functions

By default the analyzer is operated and programmed by using the membrane keypad with its four keys (see Fig. 1-1 and 1-2, Item 4 to 7).

If either the BINOS100<sup>®</sup> 2M or BINOS 100 F analyzer is equipped with an internal pump, the fifth key “PUMP” is activated by software. (see Fig. 1-2. Item 8 and chapter 7.4).

BINOS<sup>®</sup> 100 F for use in rough surroundings may optionally be equipped with a touch screen keypad without fifth key for gas sampling pump. In this case the pump is controlled via software menu.

Operator guidance prompts will appear on the 4 digit LED displays.

Battery buffering of the stored parameters prevents their loss in the absence of voltage supply.



## 7.1 FUNCTION

Pressing this key (Fig. 1-1 and 1-2, Item 3) addresses the individual analyzer functions in sequence. Merely addressing an analyzer function will not initiate an analyzer action or operation. The analyzer will stay in measurement mode until the ENTER key is pressed.

### Remark concerning the optional touch screen keypad:

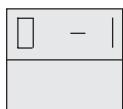
To avoid unintended keypad activation all the keys are secured by an additional user code. This code has to be entered each time **before leaving the measurement display**:

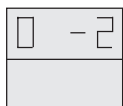


After pressing the FUNCTION key the text "Code" appears in the upper display and the following keys have to be pressed within a time period of 20 seconds: DOWN, UP, ENTER, FUNCTION. Pressing the correct sequence shows the text "Code" in the lower display too and menu scrolling is enabled.

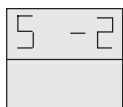
If the correct code is not entered within the time period of 20 seconds menu scrolling will still be locked and the measurement display is shown again.


The following analyzer functions and their sequences (see also Fig. 7-1) are shown:


 Zeroing channel 1

 Zeroing channel 2


 Spanning channel 1


 Spanning channel 2


 Interval Time for automatic Zeroing

 Interval Time for automatic Spanning

**Only in combination of internal solenoid valves or digital outputs and external solenoid valves, and if Auto = 1**

 Entry of concentration limits

 Entry of system parameters.

 Entry of serial interface parameters

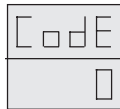
**Only with Option RS 232 C/485 Serial Interface**

## 7.2 ENTER



The **ENTER** - key (Fig. 1-1 and 1-2, Item 4) is used for the transfer of (keyed-in) numerical data to the corresponding operating parameters and for the initiation of certain operations, such as zeroing and spanning.

First time the **ENTER** key is pressed within the function sequences (following the sequences from "Zeroing (0 - 1)" to the "interface - parameter (SIP.)") the display will show the message



This indicates that - for safety reasons - a password (user code, "CODE") must be entered in order to enable access to the specific level.

If a wrong password is entered, the "CODE" display will remain and the display will be reset to the value "0".

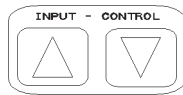
When the correct password has been entered access to the specific level is permitted.



**This password ("CODE") has a factory setting value "1" !**




### 7.3 INPUT - CONTROL



This keys (Fig. 1-1 and 1-2, Item 5 and 6) are used for the adjustment of the individual input parameter values. A single press on either key will change the current value by +/- 1.

UP  increase current value by 1

DOWN  decrease current value by 1

If either of these keys is held pressed, the value will be altered continuously. Altering rate starts with the slower rate and shifts automatically to the faster rate. When the minimum value is reached, the analyzer will automatically revert to the slower rate in order to facilitate entering the minimum value .

For any parameter a tolerance range is defined which has to be considered when entering parameter values. In addition, all values are plausibility checked as added protection against operator errors.



If within about 60 - 120 seconds no further keys have been pressed, the analyzer will automatically revert to the “analysis display” .



## 7.4 PUMP (BINOS® 100 2M/F only)



Optionally there is built-in a gas sampling pump (pumping rate max. 2,5 l/min.) into analyzers of type BINOS® 100 2M/F.

The pump can be switched on and switched off by either

- the key “PUMP” at the front panel [Fig. 1-2, Item 8, (standard BINOS® 100 2M/F only)],
- the keypad [System Parameter “PUMP” <sup>\*)</sup> (chapter 8.17)],
- via optional RS 232/485 instructions<sup>\*)</sup> <sup>\*\*) (chapter 12.5),</sup>
- via optional FOUNDATION™ Fieldbus instructions<sup>\*)</sup> <sup>\*\*) (chapter 13.2) or</sup>
- via optional digital inputs <sup>\*)</sup> <sup>\*\*) (chapter 13.1).</sup>

Optional the status of gas sampling pump is output via a digital status signal "Pump"(see Item 11.3)!

If the pump is turned on a green LED (**PUMP**, Fig. 1-2, Item 3) will light up at the front panel.

<sup>\*)</sup> BINOS® 100 2M from program version 5.0 is required

<sup>\*\*)</sup> not in combination with FOUNDATION™ Fieldbus

<sup>\*\*\*)</sup> not in combination with RS 232/485 interface



## 8. Setting System Parameters

Push the key



until the text



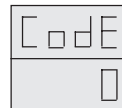
appears.

Press the key

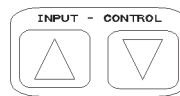


If the **Code** had not already been entered, there

will appear



Use the keys



to select the **Code**

and then using



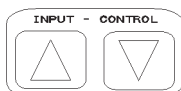
The display will now show:

8.1 Pressure Correction



To eliminate faulty measurements due to changes in barometric pressure or sample gas pressure, the operator is offered the opportunity to enter the current pressure expressed in **hPa** (mbar) in a range of 800 to 1,300 hPa. The concentration values computed by the analyzer will then be corrected to reflect the barometric pressure or sample gas pressure resp. entry.

Input values using



and



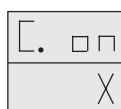
It is possible to integrate a pressure sensor with a range of 800 - 1,100 hPa.

The concentration values computed by the analyzer will then be corrected to reflect the barometric pressure to eliminate faulty measurements due to changes in barometric pressure (see technical data).



In this case it is not possible to enter pressure value manually. In attempting to enter pressure value manually, the analyzer will automatically revert to the display of measured pressure value.

8.2 Cross Compensation (internal)

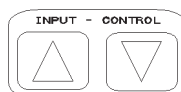


This control permits switching the electronic cross compensation feature on and off. The cross compensation feature is designed minimize mutual interferences between the two gases (e. g., CO<sub>2</sub> and CO) measured by the analyzer.

**Input value 0:** cross - compensation is disabled

**Input value 1:** cross - compensation is enabled

Change values using



and



### 8.3 Cross Compensation Calibration (internal)

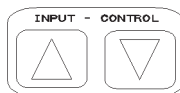


Determination of cross compensation correction factors is performed during the span adjustment. Pure test gases are required for this operation. Once cross compensation corrections have been determined, span adjustments may be performed using test gas mixtures.

**Input value 0:** spanning without cross compensation correction (**test gas mixtures**)

**Input value 1:** spanning with cross compensation correction (**pure test gases**)

Change values using



and



To perform a calibration with cross compensation correction, proceed as follows:

First perform a **zeroing** for **both** analysis channels (see chapter 9.1.1).

Then perform a **spanning** for **both** analysis channels as described in chapter 9.1.2.

Repeat spanning for the analysis channel that has been spanned first.

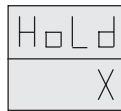


The values entered as described in chapters 8.2 and 8.3 must be "1" for performing a calibration with cross compensation correction!  
Use pure test gases only!



When using test gas mixtures, "C.Cal" must be set to "0"!

## 8.4 Hold

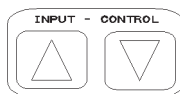


The analyzer function **HOLD** is used to lock the analog signal outputs and the concentration limits during a calibration procedure to hold the last measured values.

**Input value 0:** The outputs remain unlocked.

**Input value 1:** The outputs will be locked.

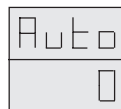
Change values using



and



## 8.5 Automatic Calibration

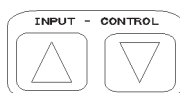


For operation with optional, internal or external solenoid valves it can be selected, if there a time-controlled (automatic) resp. a remote-controlled calibration is possible or not (in combination with solenoid valves controlled via digital outputs).

**Input value 0:** Time-controlled / remote-controlled calibration is not possible

**Input value 1:** Time-controlled / remote-controlled calibration is possible

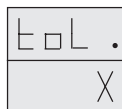
Change values using



and



## 8.6 Tolerance Check



The **tolerance** function is for the activation and deactivation of the tolerance check procedure for various calibration gases.

If the tolerance check procedure has been activated, the microprocessor will verify during calibration procedures whether the used calibration gas shows a deviation of more than 10 % from measuring range of zero (zero - level) or more than 10 % of the nominal concentration value entered resp. (span).

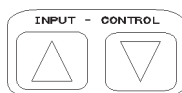
If this **tolerance is exceeded, no calibration will be performed**, and an error message will appear (see chapter 16). By default the error message will be erased after 2 - 3 minutes. Setting the tolerance check parameter to "2" will hold the error message till either a correct calibration has been performed or the analyzer has been resetted.

**Input value 0:** Tolerance check is deactivated.

**Input value 1:** Tolerance check is activated,  
error message will be erased after 2 - 3 minutes.

**Input value 2:** Tolerance check is enabled, error message is held

Change values using



and



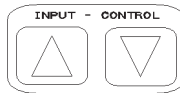
### 8.7 Display Off



Entering "1" will turn the DISPLAY off about 1 to 2 minutes after the last key was pressed. Pressing any key will turn the display on again.

- Input value 0:** Display is always turned on
- Input value 1:** Display is will be automatically turned of

Change values using

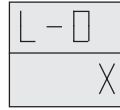


and





## 8.8 Analog Signal Outputs

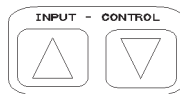


The analog signal outputs (optically isolated) are brought out to a 9 pin sub miniature D connector X2 on the analyzer rear panel. Refer to the wiring hints in chapter 29.10 !

**Input value 0:** Output signal is 0 - 10 Vdc (Option: 0 - 1 Vdc) / 0 - 20 mA.

**Input value 1:** Output signal is 2 - 10 Vdc (Option: 0.2 - 1 Vdc) / 4 - 20 mA (**life zero mode**)

Change values using



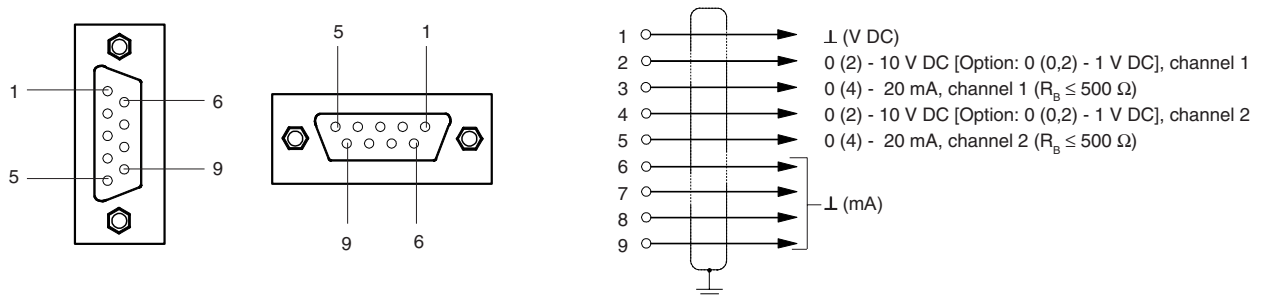
and



### Note:

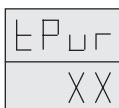
The begin of range concentration (OFS.) and the end of range concentration (END) are freely programmable (see chapter 8.12 and 8.13).

For type of voltage output (standard or option) please refer to order confirmation or identification label.



**Fig. 8-1: Pin assignments mating socket X2 (analog signal outputs)**

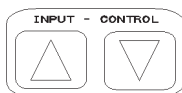
### 8.9 Flushing Period



For calibration, the gas paths must be supplied with sufficient calibration gas. The flushing period has to be fixed adequate; perform calibration only after a suitable flushing period (the calibration gas flow should be identical with sample gas flow).

This period may be set within the range **0 - 99 sec.** depending on calibration conditions.

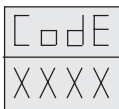
Change values using



and



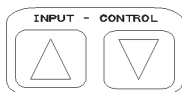
### 8.10 User Code



Factory default setting is "1".

To prevent parameter alterations by unauthorized persons, the operator may specify another password (user code).

Set the code using



and



Please take care for filing the user code.

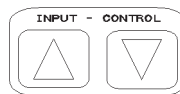
**8.11 Response Time ( $t_{90}$ )**



For some types of analysis an alteration of the analyzer damping factor, i.e. its electrical response time,  $t_{90}$ , may be required. The operator is offered the option of selecting an optimal response time for each application.

The **range of accepted values** is **2 - 60 sec.**

Change values using



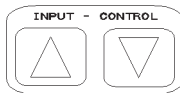
and



Input indicator for channel 2



Change values using



and



8.12 Offset (Begin of range)



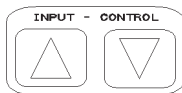
The operator is here offered the opportunity to introduce a scale offset for the analog signal output (begin of range).

Example:

For an analyzer concentration range of 0 - 25 % it is desired to measure only concentrations in the range 10 - 25 %. If the operator enters here the value 10 %, the analog signal outputs of 0 V / 0 mA or 2 (0.2) V / 4 mA will then correspond to a gas concentration of 10 %.

The displayed values are not affected.

Effect the entry using



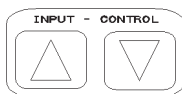
and



Entry possibility for channel 2



Use the keys



and



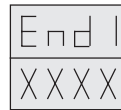
for the entry.

**Note:**

The **specifications of the analyzer** written in the data sheet are **only for OFS. = 0 and END = full - scale range set in our factory !**

It is part of customer to enter logical values for OFS. and END !

### 8.13 End of Range Value



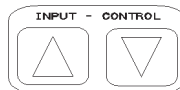
The operator is here offered the opportunity to introduce a full scale range for the analog signal output.

#### Example:

For an analyzer concentration range of 0 - 25 % it is desired to measure only concentrations in the range 0 - 15 %. If the operator enters here the value 15 %, the analog signal outputs of 10 (1) V / 20 mA will then correspond to a gas concentration of 15 %.

The displayed values are not affected.

Use the keys

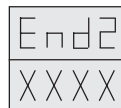


and

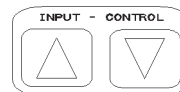


for the entry.

Entry possibility for channel 2



Use the keys



and



for the entry.

#### **Note:**

The **specifications of the analyzer** written in the data sheet are **only for OFS. = 0 and END = full - scale range set in our factory !**

It is part of customer to enter logical values for OFS. and END !

## 8.14 Reset



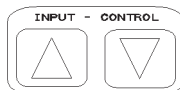
The reset operation restores the settings of the analyzer to the parameters and calibration factors set in our factory at the time of its manufacture.

This is equivalent to switching off the electrical supply line and switching off the battery buffering of the RAM's by removing the battery jumper, J7.

**All parameters and calibration factors entered by the user will be lost whenever a reset operation is performed.**

The currently valid user identification code must be entered before a reset will be executed; this will prevent inadvertent resets.

Entry is performed using



followed by

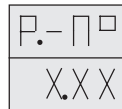


Whenever a reset operation is initiated, the analyzer operating program will be restarted, just as it is when the instrument is first switched on (see chapter 6).



Jumper J6, which activates the watchdog circuitry must be inserted if the reset operation is to be correctly executed.

**8.15 Program Version**



The Program Version (No. of the installed software - version) will be displayed.

Press the key



**8.16 Serial - No.**



The Serial - No. will be displayed. (Please note this number for further contact with our factory-maintenance, service, etc.)

Push the key



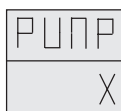
Continuation of Serial - No.



Press the key



### 8.17 Pump<sup>\*)</sup>



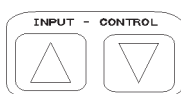
This display shows the status of gas sampling pump.

If the function is enabled in “Pump Control” (“P.Ctl.”, see chapter 8.18), the pump can be switching On or Off via this input.

**Display / Entry of 0:** gas sampling pump is Off

**Display / Entry of 1:** gas sampling pump is On

Entry is performed using



followed by



### 8.18 Pump Control<sup>\*)</sup>



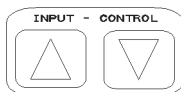
In this item you can determine the input for pump control.

**Entry of 0:** pump control via front panel key

**Entry of 1:** pump control via system parameter “PUMP” (chapter 8.17)

**Entry of 2:** pump control via optional digital input (Item 13.1)

Entry is performed using



followed by

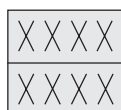


Push the key



until

the displays show



The analyzer now is back in the analysis mode.

<sup>\*)</sup> BINOS® 100 2M/F with software version 5.0 or higher only



## 9. Calibration

To insure correct measurement results, zeroing and spanning should be carried out once a week. Spanning can be performed only after zeroing before.

For the calibration procedure the analyzer has to be supplied with unpressurized test gases through the respective gas inlets (cf. chapter 5.3) at a gas flow rate of about 1 l/min (the same as with sample gas) !



After switching on the analyzer, wait at least approx. 15 to 50 minutes (depending on installed detectors) before admit gas to the analyzer !

### Note !

For operation with optional, internal or external solenoid valves the solenoid valves are activated automatically by the respective function (via digital outputs). If the analyzer is in "calibration mode", a digital status signal "calibration" may be set (see chapter 11.3).

### Zeroing

For zeroing, the analyzer has to be flushed with nitrogen (N<sub>2</sub>) or adequate zerogas (e. g. synth. air or conditioned air).

### Spanning

The span gas concentration should be in a range of 80 % - 110 % of full - scale range !  
For lower span gas concentrations the measuring accuracy could be decreased for sample gas concentrations which are above the span gas concentration !  
Spanning for oxygen measurement can be done using ambient air as span gas, if the oxygen concentration is known and constant.



When using span gas mixtures the entry for "C.Cal" must be set to "0" (see chapter 8.3) !  
If there is no built-in pressure sensor, the correct pressure must be entered before performing the calibration, if you want to have the possibility of pressure correction (see chapter 8.1) !

## 9.1 Manual Calibration

### 9.1.1 Zeroing

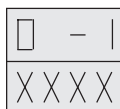


Zeroing will set the actually measured gas concentration to “zero”.

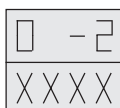
Push the key



until the display shows



(Zeroing channel 1) or

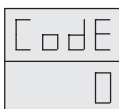


(Zeroing channel 2) resp.

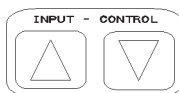
Press the key



There will appear



Use the keys

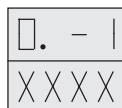


to select the correct **user - code**

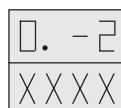
and enter using.



The displays will now show



resp.



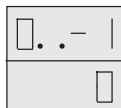
The **actual** zero - level will be displayed.

Wait at least the entered flushing period and  $t_{90}$  time to go by.

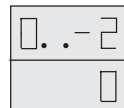
Push the key



The **nominal value**



or



will be displayed.

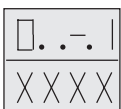
If the actual and nominal zero levels match, the next function can be selected using the **FUNCTION** key (without zeroing).

If the two values mismatch,

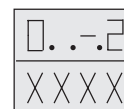
press the key



The actual measuring value



or



will be displayed

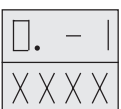
To start zeroing press



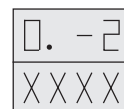
again.

As soon as zeroing has finished, the display indicates

the **actual measuring value**



resp.



will be displayed.

The keyboard will only be released after another flushing period and  $t_{90}$  time.

If Hold = 1, the analog signal outputs and the concentration limits are released, too.

To leave “calibration mode” press



## 9.1.2 Spanning



Verification of the span calibration is essential for accurate concentration measurement.

Spanning can be performed only after zeroing has been done.

Spanning will set the actually measured gas concentration to the entered “span gas setpoint”.

**Note:** The span gas concentration should be in a range of 80 % - 110 % of full - scale range !  
For lower span gas concentrations the measuring accuracy could be decreased for sample gas concentrations, which are above the span gas concentration !  
Spanning for oxygen measurement can be done using ambient air as span gas, if the oxygen concentration is known and constant.

When using span gas mixtures the entry for “C.Cal” must be set to “0” (see chapter 8.3)!

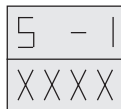


If there is no built-in pressure sensor, the correct pressure must be entered before performing the calibration, if you want to make use of pressure correction (see chapter 8.1) !

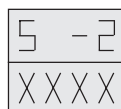
Push the key



until the display shows



(Spanning channel 1) or



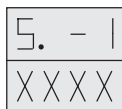
(Spanning channel 2) resp.

Press the key

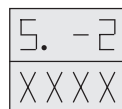


Enter the correct **user code**, if not already entered

The displays will now show



resp.



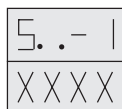
The **actual** concentration - level will be displayed.

Wait at least the entered flushing period and  $t_{90}$  time to go by.

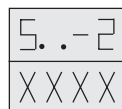
Push the key



The **test gas setpoint**



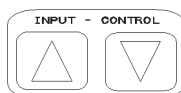
resp.



will be displayed.

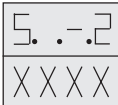
If necessary, enter the test gas setpoint value, taken from the manufacturer's certificate on the gas bottle

using the keys



and




The actual measuring value  resp.  will be displayed


Quit the calibration mode by pressing the **FUNCTION - key** (nominal value is entered without span calibration)

or push  again to start spanning .

As soon as spanning has finished, the display indicates

the **actual** measuring value  resp.  will be displayed.

The keyboard will only be released after another flushing period and  $t_{90}$  time.  
If Hold = 1, the analog signal outputs and the concentration limits are released, too.

To leave calibration mode press 

When using span gas mixtures the entry for "C.Cal" must be set to "0" (see chapter 8.3)!



If there is no built-in pressure sensor, the correct pressure must be entered before performing the calibration, if you want to make use of pressure correction (see chapter 8.1) !

## 9.2 Time-Controlled Calibration Mode (Option)

A time-controlled calibration only can be done with internal or separate external solenoid valves via digital outputs. The automatic function of the analyzer must also be activated correctly (cf. chapter 8.5).

With this function, the analyzer can perform an automatic calibration at preset time intervals. The displays of the analyzer shows additional the functions **t - AO** and **t - AS** using the **FUNCTION** - key.

### Note !

For a time-controlled calibration procedure, the test gases **must** be supplied through “solenoid valves” controlled by the analyzer in order to ensure the supply of test gases in correct sequence.

If the test gas concentration has changed, the correct setpoint is to enter first (see chapter 9.1.2).

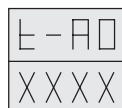
### 9.2.1 Zeroing



Push the key



until the displays show

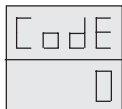


Press the key

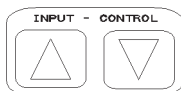


If the correct **user code** has not yet been entered,

the displays show



Use the keys

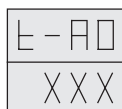


to select the correct **user - code**

and enter using



It appears



You can enter a time interval (hours), when an automatic zeroing has to be performed.

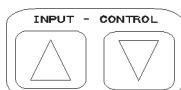
Point of reference is the current time.

Range of accepted entries: **0 - 999** (hours)

**Note !**

**If the entry is "0" (zero), the time - controlled calibration is deactivated.**

Entry is performed using



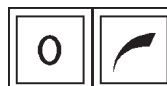
followed by



After entry of interval, zeroing will be done automatically at the end of the entered time interval.



### 9.2.2 Combined Zeroing and Spanning

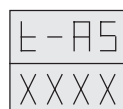


With this function a span calibration will be performed after completion of zeroing.

Press the key



until the message



appears

Press the key



Enter the correct **user code**, if not already entered

The displays will now show



You can enter a time interval (hours), when a automatic zeroing and after that a spanning has to be performed.

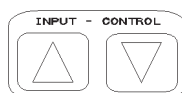
Point of reference is the current time.

Range of accepted entries: **0 - 999** (hours)

**Note !**

**If the entry is "0" (zero), the time - controlled calibration is switched off.**

Entry is performed using



followed by



After entry of interval, calibration will be done automatically at the end of the entered time interval.

### 9.3 Remote-Controlled Calibration Mode (Option)

A remote-controlled calibration requires internal solenoid valves or external solenoid valves controlled via digital outputs. Additionally the correct test gas setpoint has to be set first (manually: chapter 9.1.2 / serial interface option chapter 12.5). The automatic function of the analyzer must also be activated correctly (cf. chapter 8.5).

A calibration can be started via

- serial interface option (chapter 12.5)
- digital inputs option (chapter 13.1)
- FOUNDATION™ Fieldbus (chapter 13.2)

A calibration will be performed as described in either chapter 9.1 (single channel zeroing or spanning) or in chapter 9.2.2 (combined zeroing and spanning), depending on start command.

## 10. Measurement / Switching Off

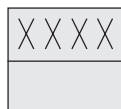
### 10.1 Measurement



Analyzer warming-up after switching on takes about 15 to 50 minutes, depending on the installed detectors !

- Supply sample gas to the gas inlet fitting (chapter 5.3).
- Switching on optional sample gas pump (c.f. chapter 7.4).
- Adjust the gas flow rate (with optional needle valve) within the specified rate.

The analyzer must be in the “analysis mode”, i. e. the displays must show



#### Note !

If another mode has been selected, the analyzer will automatically return to the analysis display when a period of 60 - 120 seconds has elapsed after the last key actuation or after the last completion of an operation!

The analyzer will remain at analysis display until another mode is selected.

#### Note for analyzers with electrochemical O<sub>2</sub> cell!

On account of the measuring principle the electrochemical O<sub>2</sub> cell needs a minimum internal consumption of oxygen (residual humidity avoids the cell running dry). Continuously supplying cells with dry sample gas of low grade oxygen concentration or with oxygen-free sample gas could result a reversible change of O<sub>2</sub> sensitivity. The output signal will become unstable.

For correct measurement the cells have to be supplied with O<sub>2</sub> concentrations of at least 0.1 Vol.-%. We recommend to use the cells in intervall measurement (purge cells with conditioned (removal of dust but no drying) ambient air during measurement breaks).

If it is necessary to interrupt oxygen supply for several hours or days, the cell has to regenerate (supply cell for about one day with ambient air). Temporary flushing with nitrogen (N<sub>2</sub>) for less than 1 h (e.g. analyzer zeroing) does not influence the measuring quality.

## MEASUREMENT/SWITCHING OFF

### SWITCHING OFF

Before switching off the analyzer purge all the gas lines for about 5 minutes with zero gas (N<sub>2</sub>) or adequate conditioned air. The full procedure for shutting down is as follows:

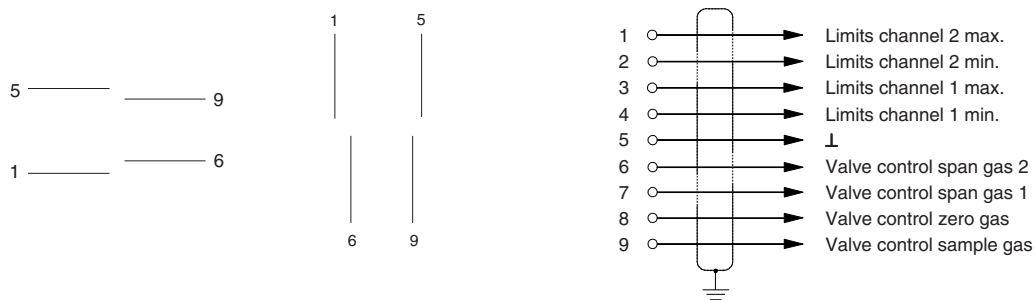


For analyzers with electrochemical O<sub>2</sub> cell purge all gas lines with conditioned ambient air before closing the gas line fittings for transport or depositing the analyzer.

- Supply zero gas to the gas inlet fitting.
- Switch on the optional sample gas pump (see chapter 7.4).
- Adjust the gas flow rate (with optional needle valve) within the specified rate.
- **Wait 5 minutes**
- Switch Off by disconnecting the voltage supply.
- Shut Off the gas supply.
- Close all gas line fittings immediately.

## 11. Digital Outputs

All standard digital outputs are available on plug X 3 at the rear panel.  
 The maximum output load is 30 V DC / 30 mA (“Open Collector”).  
 Observe the wiring hints in chapter 29.10 !



**Fig. 11-1: Pin Assignments X 3 (Digital Outputs)**

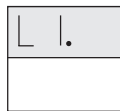
## 11.1 Concentration Limits

One upper and one lower concentration limit can be assigned for each channel, freely selectable by the operator within the available concentration range.

The last right decimal point of the related display will start to flash whenever a concentration limit value is reached.

Additional digital signal outputs for the concentration limits are available at plug X 3 on the rear panel ("Open Collector", max. 30 V DC / 30 mA).

Press the key  until the text

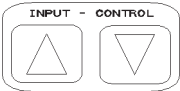


appears.


Press the key 

If the correct **user code** has not yet been entered,

the message  appears.

Press the keys  to select the correct **user code**,

enter with the  key.

The displays show  **lower limit channel 1**

Use the keys  to set the limit value.

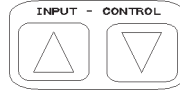
Push the key  to enter the value.

The displays show



**upper limit channel 1**

Use the keys



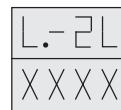
to set the limit value.

Press the key



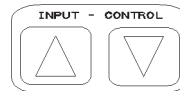
to enter the value.

Now the displays show



**lower limit channel 2**

Use the keys



to set the limit value.

Press the key



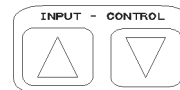
to enter the value.

The displays show



**upper limit channel 2**

Use the keys



to set the limit value.

Press the key



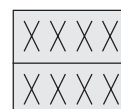
to enter the value.

Press



until

the displays show



The analyzer is now back in the analysis display.

### 11.2 Valve Control

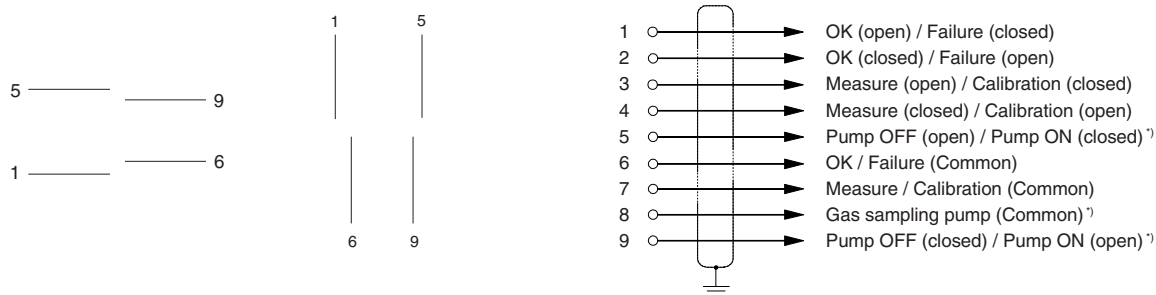
Optional external solenoid valves have to be connected to plug X 3 on the rear panel to be controlled by the analyzer. Observe the wiring hints in chapter 29.10 !

### 11.3 Status Signals (Option non-voltage-carrying relay contacts)

Three optional status signals are available on the 9 pin subminiature D plug X 1 on the rear panel of the analyzer (see chapter 7.4, 9. and 13., too).

These signals are floating contacts with a maximum load of 30 V / 1 A / 30 W !

Observe the wiring hints in chapter 29.10 !



**Fig. 11-2: Pin Assignments X 1 (Status Signals)**

<sup>1)</sup> BINOS® 100 2M/F with software revision 5.0 or higher only



## 12. Serial Interface (Option)

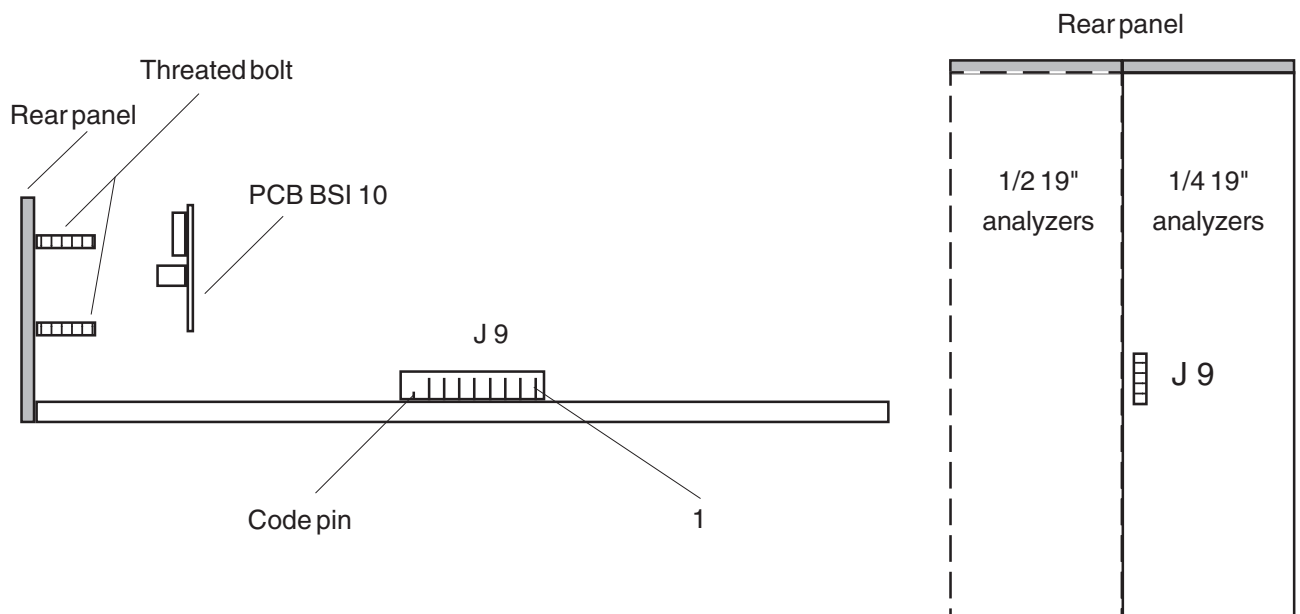
### 12.1 Upgrading Serial Interface / Status Signals

(status signals only: PCB BSI 10, Catalog - No.: 43 001 590,  
 RS 232 - Interface: PCB BSI 10 with PCB SIF 232, Catalog - No.: CH 000 069  
 RS 485 - Interface: PCB BSI 10 with PCB SIF 485, Catalog - No.: CH 000 070,  
 see chapter 12.3.2, too)



Be sure to observe the safety measures !

- Switch off the analyzer and open the housing (see 23.)
- Mount the circuit board to the threaded bolts at the rear panel and fix it using the washers and the screws.
- Connect the signal cable to connector **J9** on BKS paying attention to the coding pin.



**Fig. 12-1: Installation of PCB BSI 10**

- For upgrading a serial interface insert the EPROM delivered together with the board (see chapter 28.).

## 12.2 General

The analyzer is equipped with a serial interface enabling communication with a host computer. The host computer can call up, prescribe, or alter parameters as well as initiate analyzer operations, using standardized protocols. The optional BSI 10 plug in circuit board constitutes the hardware interface. This may be configured as RS 232 C or RS 485 interface. The RS 485 interface permits networking several analyzers. Each analyzer may then be addressed using an assignment numerical ID -code.

Communication is always initiated by the host computer; i.e., analyzer behave passively until the host computer requests information from them or demands commencement of an action.

Communications use so - called “telegrams” being exchanged between the host computer and the analyzer(s). Syntax for these telegrams is established in protocols.

Telegrams always commence with the **"\$" start character**, immediately followed by a three - digit instruction code.

Subsequent elements of telegrams are segregated by the **";" hyphen character**.

The final element of all telegrams transmitted must be the “CR” termination character.

Upon receipt of the terminate character, the analyzer attempts to evaluate the current contents of its input buffer as a valid telegram. If the syntax of the transmitted telegram is correct, the analyzer will transmit a response telegram to the host computer. This consists of the start character, an instruction code, requested data, a block - parity byte, and the termination character.

If the syntax of the transmitted telegram was not correct, the analyzer will transmit a status telegram containing an error message to the host computer. Each terminate character reception thus initiates an analyzer response.

To avoid detecting transmission errors, the host computer can insert a message -length parity byte immediately preceding the terminate character for verification by the analyzer.

The analyzer invariably transmits message length parity bytes immediately preceding termination characters.

The elapsed time between the reception of start characters and termination characters is not limited by the analyzer; i.e., there are no “time out” periods.

If the host computer transmits any new characters before the analyzer has responded to the preceding telegram, the analyzer’s input buffer will reject them; i.e., these characters will be ignored by the analyzer.

The **transmission rate** may be set between **600** and **38,400 baud**.  
An **echo mode** may also be activated.

The analyzer software is configured such as that telegrams may be sent to the host computer at time intervals of 150 ms and greater.

## 12.3 Start Up

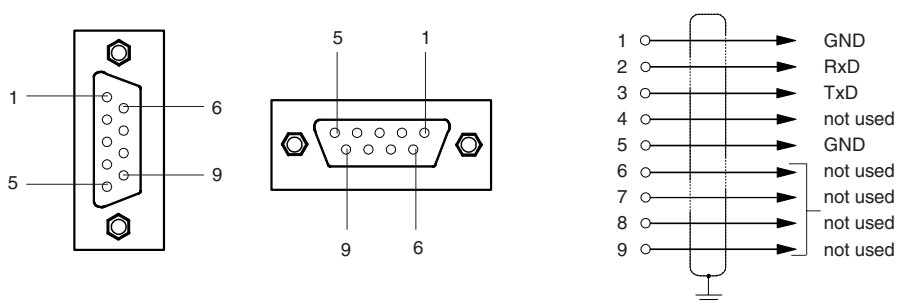
The analyzer has been set in our factory to RS 232 C or RS 485 interface via the plugged PCB SIF 232 or SIF 485 on the PCB BSI 10.

The parameter 232c has also been set to 0 = NO or 1 = YES in the SIP (Serial Interface Parameters) line.

Interconnection to the interface is via the 9 pin socket „Interface“ or “X4 Output” on the analyzer rear panel. Observe the wiring hints in chapter 29.10 !

### 12.3.1 RS 232 C

This interface requires a shielded cable having at least three internal conductors.

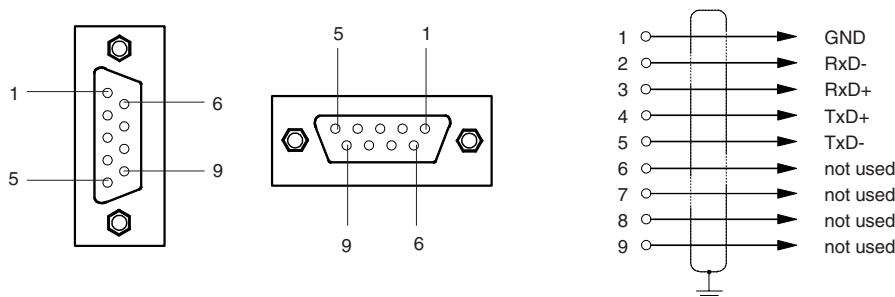


**Fig. 12-2: Pin Assignments “RS 232 Interface”**

### 12.3.2 RS 485

Configure 2- or 4-wire operation via solder bridge LB 1 of PCB SIF 485 before mounting the PCB. Connecting of [1 - 2] 2-wire-operation is selected. Connecting of [2 - 3] 4-wire-operation is active.

Switch on network termination via soldering bridges at both ends of interface connection. For network operation with several analyzers via RS485 interface, termination has to be done at both ends of network connection only. For the other analyzers the soldering bridges have to be open. Close soldering bridge LB2 for 2-wire-operation. For 4-wire-operation close LB2 and LB3.



**Fig. 12-3: Pin Assignments “RS 485 Interface”**

In contrast to RS 232 C operation, simultaneous transmission and reception is not implemented in this standard. This would not result in damage to the electronics, but could lead to destroy of data. The analyzer behaves passively in this mode of operation; i.e., it keeps its transceiver set for reception whenever it is not transmitting. Since the time periods for transmission and reception are controlled by protocols, “data collisions” are excluded.

### 12.3.3 Switching ON/OFF Interface Operation

The analyzer may be set to either “**online**” or “**offline**” status. This setting may be performed either from the keypad or via telegram input.

#### Keyboard setting:

SIP parameter On.-L. = 1 for online status

SIP parameter On.-L. = 0 for offline status

#### Telegram setting:

Instruction code 6: sets analyzer online status

Instruction code 7: sets analyzer offline status

If the analyzer is set to **offline** status, it will accept only instruction code 6. All other instructions will be ignored and result in transmission of appropriate status telegrams.

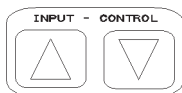
### 12.3.4 Setting Interface Parameters

Agreement of interface parameters between analyzer and host computer is a fundamental requirement for communication without errors.

The following analyzer parameters are concerned:

- baud rate: 600 / 1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 bits/s
- data bits: 8
- stop bits: 2
- parity bit: none
- echo mode: on / off (received characters will be retransmitted immediately)
- LPB-test: on / off (message - length parity check)
- ID-no.: 0 to 99 (device ID - no. in RS 485 mode)

All entries are made using the keys



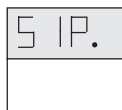
and



Press the key



until

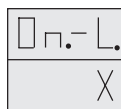


appears,

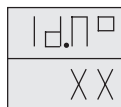
then push the key



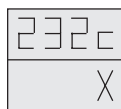
The unit is now ready for **code** entry, if such has not already been performed.



0 = off - line status  
 1 = on - line status



Each device is assigned a device number for operation through the RS 485 interface (0 - 99).



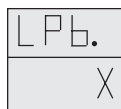
Select interface type:  
 0 = RS 485      1 = RS 232 C



Set baud rate:  
 0 = 4,800      1 = 2,400      2 = 1,200      3 = 600  
 4 = 9,600      5 = 19,200      6 = 38,400



Echo-mode operation:  
 0 = OFF      1 = ON



Message - block parity check  
 0 = OFF      1 = ON

## 12.4 Telegram Syntax

Telegrams are assembled as follows:

### 12.4.1 Start Character (“\$” = Hex 24)

If the start character is missing, this will result in transmission of an appropriate status telegram by the analyzer.

### 12.4.2 Terminate Character (“CR” = Hex 0D)

If the terminate character is missing, no decoding of the transmitted information will be performed, and the analyzer will not respond. No response message will be transmitted.

### 12.4.3 Instruction Code

Each instruction is assigned a unique three digit numerical instruction code. If a received instruction code should be other than three digits in length or contain non-numerical ASCII-characters, the analyzer will transmit an appropriate status telegram. Reception of unassigned instruction codes will also result in the transmittal of a status telegram.

In the RS 232 C mode of operation, the instruction code immediately follows the start character; in the RS 485 mode of operation, the start character is followed by a two digit device identification code, the separator character “;”, and a three digit instruction code, in this order.

### 12.4.4 Hyphen Character (“;” = Hex 3B)

Individual elements of a telegram line are separated by this hyphen character. Missing hyphen characters can lead to misinterpretations of telegrams, and will result in transmission of an appropriate status telegram.



### 12.4.5 Status Telegram

If telegram syntax is faulty, or analyzer is unable to act upon an instruction received, then the analyzer will transmit a status telegram to the host computer.

These status telegrams are listed here for reference:

\$ID;000;S100;LPB<CR>	unrecognized instruction code
\$ID;000;S101;LPB<CR>	LP byte in error
\$ID;000;S102;LPB<CR>	start character missing
\$ID;000;S103;LPB<CR>	input buffer overflow
\$ID;xxx;S104;LPB<CR>	analyzer offline status
\$ID;xxx;S105;LPB<CR>	text line too long
\$ID;xxx;S106;LPB<CR>	undefined instruction
\$ID;xxx;S107;LPB<CR>	invalid integer value
\$ID;xxx;S108;LPB<CR>	numerical value outside defined range
\$ID;xxx;S109;LPB<CR>	invalid failure/status code
\$ID;xxx;S110;LPB<CR>	instruction can not be done here
\$ID;xxx;S111;LPB<CR>	failure in transmitted character
\$ID;xxx;S112;LPB<CR>	zeroing running
\$ID;xxx;S113;LPB<CR>	spanning running
\$ID;xxx;S114;LPB<CR>	invalid real number
\$ID;xxx;S115;LPB<CR>	automatic calibration mode off
\$ID;xxx;S116;LPB<CR>	parameter outside defined range
\$ID;xxx;S117;LPB<CR>	preflushing period is running

xxx: instruction code  
 ID: device ID no. in RS 485 mode  
 LPB: message length parity byte  
 <CR>: terminate character

### 12.4.6 Numerical Representations

Telegrams may contain integers or real numbers. The formats for these numbers are subject to the following restrictions.

- Integers:
- maximum value =  $2^{16} - 1$
  - positive numbers only accepted
  - no decimal points allowed

- Real:
- maximum of 6 digits accepted
  - no alphabetic characters (e.g. 2.2E-6) allowed
  - analyzer output is 6 - digit real numbers

### 12.4.7 Block Parity Check

The master control computer may insert a message length parity byte into telegrams. These invariably consist of two characters.

The message - length parity byte is the cumulatively EXCLUSIVE - OR correlation of all previously transmitted characters of the telegram line. Representation is in hexadecimal format. For example, if the decimal value should be decimal 13, this will be represented by the two characters "OD", i.e., 030H and 044H.

The verification procedure may be enabled or disabled at the analyzer (see chapter 12.3.4).

## 12.5 Instruction Syntax

Code definitions:

RP:	receive parameters	analyzer is accepting values
SP:	send parameters	analyzer is sending values
RI:	receive instructions	
k:	channel numbers 0 to 2	
m:	range number	
w:	value	
<ID>:	analyzer ID - no. for RS 485 mode of operation; follows start character	
LPB:	message - length parity byte	
<CR>:	terminate character	

Receipt of any instruction codes not listed in the following section will be acknowledged by transmittal of status code 106. Future expansions will make use of code numbers not currently in use.

## 12.5.1 Instruction Listing

### Instruction syntax:

\$ID;001;k;LPB<CR>  
\$ID;002;k;LPB<CR>  
\$ID;003;k;LPB<CR>  
\$ID;005;m;k;LPB<CR>  
\$ID;006;LPB<CR>  
\$ID;007;LPB<CR>  
\$ID;008;LPB<CR> <sup>1)</sup>  
\$ID;009;w;LPB<CR> <sup>1)</sup>  
\$ID;011;m;k;LPB<CR>  
\$ID;013;k;LPB<CR>  
\$ID;014;w;k;LPB<CR>  
\$ID;017;k;LPB<CR>  
\$ID;018;w;k;LPB<CR>  
\$ID;019;k;LPB<CR>  
\$ID;020;w;k;LPB<CR>  
\$ID;023;k;LPB<CR>  
\$ID;028;m;k;LPB<CR>  
\$ID;029;m;w;k;LPB<CR>  
\$ID;030;LPB<CR>  
\$ID;031;t;LPB<CR>  
  
\$ID;603;k;LPB<CR>  
\$ID;604;k;LPB<CR>  
\$ID;605;k;LPB<CR>  
\$ID;606;0;LPB<CR>  
\$ID;626;LPB<CR>  
\$ID;627;LPB<CR>  
  
\$ID;645;0;LPB<CR>  
\$ID;646;w;LPB<CR>

### Instruction description:

RI stand-by status (all valves closed)  
RI sample gas valve open  
RI zero gas valve open  
RI span gas valve open  
RI on - line status  
RI off - line status  
SP pump status <sup>1)</sup>  
RI pump status <sup>1)</sup> w=0: pump Off, w=1: pump On  
SP at full scale range  
SP  $t_{90}$  (response time)  
RP  $t_{90}$  (response time)  
SP preflushing period (zero gas)  
RP preflushing period (zero gas)  
SP preflushing period (span gas)  
RP preflushing period (span gas)  
SP concentration  
SP span gas concentration  
RP span gas concentration  
SP status messages  
SP serial number (t=0, max. 10 characters)  
channel identification (t=1: ch. 1, t=2: ch. 2)  
SP gas component  
RI automatic zeroing  
RI automatic spanning  
RI automatic zeroing & spanning  
SP E-Prom / Software version  
SP failure message (possible error **batt.** is clearing by read out)  
SP pressure value  
SP solenoid valve status (w=1: sample gas valve, w=2: zero gas valve, w=4: spangas 1, w=8: spangas 2)

<sup>1)</sup> BINOS® 100 2M/F from program version 5.0 is required



### 12.5.2.2 Pump Status (Instruction 008) <sup>\*)</sup>

The response telegram for instruction

“\$ID;008;LPB<CR> SP Pump status”

shows as follows:

\$ID;008;w;LPB<CR>

with w = pump status

0: Pump Off

1: Pump On

<sup>\*)</sup> BINOS® 100 2M/F from program version 5.0 is required

## 13. Digital Inputs / Foundation™ Fieldbus (BINOS® 100 2M/F option only)



Be sure to observe the safety measures for all workings at the analyzer!

### 13.1 Digital Inputs

#### 13.1.1 General

To remotely control different conditions of analyzer BINOS® 100 2M/F, the analyzer can optionally be equipped with 7 digital inputs. They are available at terminals on the rear side of the analyzer (Fig. 1-8, Item 9). The inputs are active only if the analyzer is equipped with built-in solenoid valve block or if the solenoid valves are connected to the digital outputs (see chapter 29.5.1). Observe the wiring hints in chapter 29.10 !

V+		+ 5 V DC
V-		⊥
E1		start zero calibration channel 1 & 2
E2		start span calibration channel 1
E3		start span calibration channel 2
E4		open zero gas valve
E5		open span gas valve 1
E6		open span gas valve 2
E7		close sample gas valve / sample gas pump off

**Fig. 13-1: Terminal assignments “Digital Inputs”**

The analyzer may be controlled by either control voltages or floating contacts.

A “low signal” has to be < 1.4 V dc, a “high signal” has to be > 3.5 V dc (max. 30 V dc). Reference point is terminal “V-” (⊥).

To work with floating contacts, customer can use the intrinsic-safe output voltage of “+ 5 V DC” at terminal “V+”.

#### 13.1.2 Start of Calibration

Inputs “E1 to E3”: The analyzer will start a calibration procedure if control signal changes from “low-level” to “high-level”. These inputs have a higher priority than inputs “E4 to E7”

### 13.1.3 Valve Control

The inputs “E4 to E7” are level sensitive with descending priority. That means “E4” has highest priority and “E7” has lowest priority.

At input “E4” (open zero gas valve) a “high-signal” opens the zero gas valve and closes all the other valves, no matter of the signal levels at “E5 to E7”.

A “high-signal” at “E5” opens the span gas valve 1 and closes all the other valves if “E4” has “low-level”, no matter of the signal levels at “E6 and E7”.

Input “E7” has a special logic: A “low-level” opens and a “high-level” closes the sample gas valve, whereat the inputs “E4 to E6” have to be at “low-level”.

### 13.1.4 Pump Control

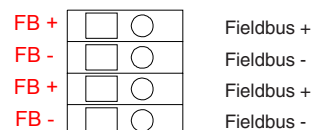
For the case, that the optional gas sampling pump is controlled via digital input (see chapter 8.18) this is done using input “E7”, too. A “low-level” on “E7” switches on and a “high-signal” switches off the gas sampling pump, irrespective of the signals at “E1 to E6”.

## 13.2 FOUNDATION™ Fieldbus \*)

For communication via FOUNDATION™ Fieldbus terminals are available at the analyzer's rear side (Fig. 1-8, Item 9).

For exact description see separate FOUNDATION™ Fieldbus specific manual!

Observe the wiring hints in chapter 29.10 !



**Fig. 13-2: Terminal strip assignments “Fieldbus connection”**

\*) only possible if serial interface RS 232/485 is not request !



## 14. Cross Compensation / Setting of Response time (TC Option only)

### 14.1 Cross Compensation

For gas mixtures of two gas components (binary gas mixtures) with different thermal conductivities the analyzer may be calibrated to directly show the concentration of one of the gas component. The same is applicable for “quasi-binary” gas mixtures of more than two components with only a single component (the component to be measured) of varying concentration. The composition of the remainder of the gas mixture remains constant in time.

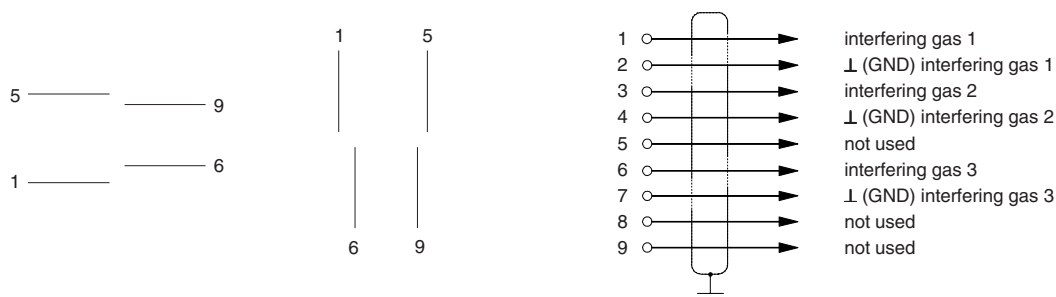
For the more common case that more than one component of a sample gas mixture has varying concentrations the result of this measuring principle is non-selective; i.e., it will not be unambiguously related to the true concentration of the gas component of interest.

If the concentrations of interfering gas components are detected by using other gas analyzers and the analytical signals thus obtained are supplied to the analyzer via rear panel plug “CROSS COMP.” (Item 9 of Fig. 1-5) or “Analog In” (Item 5 of Fig. 1-7 and 1-8), then the disturbing effects of any interfering gas component may be electronically compensated .

The analyzer is designed for compensating up to 3 interfering gas components.

Possible signal inputs are 0 (0.2)- 1 V, 0 (2)- 10 V or 0 (4) - 20 mA.

Observe the wiring hints in chapter 29.10 !



**Fig. 14-1: Pin assignments “Cross. Comp.” / “Analog In”**  
(TC-Option analog signal inputs for interference compensation)

### 14.1.1 Preparing Actions

The adjustment procedure for alteration the factory settings of cross compensation is as follows:

The number of interfering gases and the type of analog input signal is selected by configuring solder bridges on the printed circuit boards “WAP 100” (TC signal processing) and “BSE 01” (analog input signals).

- Open the analyzer housing (cf. Section 23).
- Remove the PCB’s and check and / or alter the solder bridges (cf. table 14-1).

Analog Input		PCB WAP 100		PCB BSE 01	
Signal	Number 1	LB 9	LB 8	LB 1	LB 9
	2	LB 6	LB 7	LB 2	LB 6
	3	LB 13	LB 12	LB 3	LB 12
0 - 1 V DC		1-2	open	open	closed
0 - 10 V DC		1-2	open	open	open
0 - 20 mA		1-2	open	closed	closed
0.2 - 1 V DC		2-3	closed	open	closed
2 - 10 V DC		2-3	closed	open	open
4 - 20 mA		2-3	closed	closed	closed
not used		open	open	open	open

**Table 14-1: Solder bridges**  
 (TC option analog signal inputs for cross compensation)

- Reinstall the PCB’s and correctly replace any connector.

### 14.1.2 Adjustment Procedure

- Switch on the TC analyzer (chapter 6.) and all analyzers used for measuring interfering gas components.
- Perform zeroing and spanning of all relevant measuring channels.
- Connect the gas paths of all analyzers in series and purge with zero gas (N<sub>2</sub>, nitrogen).
- Connect the analog signals of the analyzers used for measuring interfering gas components to the respective analog input (Fig. 14-1) of the TC analyzer.

The following steps have to be executed for each interfering gas separately.

- Supply the maximum concentration of the respective interfering gas (maximum concentration should be full-scale of the analyzer measuring the interfering gas).



For external analyzers with different measuring ranges be sure that the analog signal connected to the TC analyzer is related to the highest measuring range and that this measuring range does not change while adjusting the cross compensation.

- Adjust the correlated potentiometers of the PCB "WAP 100" to set the analog signal output of TC measurement to "Zero".

The potentiometer assignments is as follows:

Interfering gas / analog input 1: Q 1 (R 71)

Interfering gas / analog input 2: Q 2 (R 84)

Interfering gas / analog input 3: Q 3 (R 118)

- Purge with zero gas (N<sub>2</sub>, nitrogen), check the zero point and start a zero calibration via keypad again if necessary.  
Supply the maximum concentration of the respective interfering gas again and perform a fine setting of zero-point using the correlated potentiometers of PCB "WAP 100".

When the adjustment has been finished

- Close the analyzer housing (cf. Section 23).



## 16. List of Failures

Some of the failures which may arise during measurement will be reported on the displays in forms of error codes.

When such a failure arises, the display's will show the concentration value

alternating with E. XX (E = ERROR).



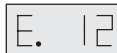
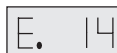
### Note !


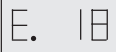

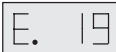


If there is an "error message", a digital status signal "Failure" can be given optional (see Item 10.3)!




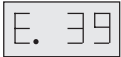


Be sure to observe the safety measures for all workings at the analyzer!

Error Code	Possible Reasons	Check / Correct
<b>No Display</b>	1. Displays are "switched OFF"  2. Voltage supply absent.  BINOS® 100 F  3. Connection front panel /BKS absent.	1. Press any key.  Check parameter dOFF (see chapter 8.7).  2. Check connection mains line/PS  Check external power supply  Check electrical supply (see Fig. 1-5 and 1-6, Item 3 Fig. 1-7 to 1-9, Item 10).  Check internal fuses F1 and F2  3. Check connection BKB - BKS (X1) (see chapter 18.1).

Error Code	Possible Reasons	Check / Correct
<p>Flashing</p> 	<p>Battery buffer faulty.</p> <p>The EPROM default values were charged.</p>	<p>Check, if Jumper J 7 is plugged (see chapter 19.).</p> <p>Exchange battery, if battery voltage &lt; 3,5 V (BKS - Jumper J7 plugged).</p> <p>The error is clearing after depressing any key or with serial interface instruction \$627.</p>
 Channel 1   Channel 2  <p>A/D-Conversion-End-Signal absent</p>	<ol style="list-style-type: none"> <li>1. Jumper not or incorrect plugged.</li> <li>2. Positive or negative reference voltage absent.</li> <li>3. Light barrier signal absent.</li> <li>4. IR channel: Chopper drive inoperative</li> <li>4. Supply voltage (internal 6 V DC) absent.</li> </ol>	<ol style="list-style-type: none"> <li>1. Channel 1: Check Jumper J1 Channel 2: Check Jumper J2 (see chapter 18.)  Switch analyzer off and then on again.</li> <li>2. Check reference voltage (see chapter 17.1.2/17.1.3).</li> <li>3. Check connection X9 / light barrier (see chapter 18.)  Check measuring point 17.1.6</li> <li>4. Check connection X2 / chopper drive (see chapter 18.)  Check measuring point 17.1.4</li> <li>4. Check measuring point 17.1.1</li> </ol>
 <p>Temperature compensation interfered</p>	<ol style="list-style-type: none"> <li>1. Start-up of A/D-conversion in temperature channel absent.</li> <li>2. Supply voltage (internal 6 V DC) absent.</li> </ol>	<ol style="list-style-type: none"> <li>1. Switch analyzer off and then on again.</li> <li>2. Check measuring point 17.1.1</li> </ol>

Error Code	Possible Reasons	Check / Correct
 Channel 1  Channel 2  Tolerance error  Zero-gas value differs more than 10% of measuring range from zero.	<ol style="list-style-type: none"> <li>Incorrect zero gas in use.</li> <li>IR channel: Photometer section contaminated.</li> <li>Analyzer not calibrated.</li> </ol>	<ol style="list-style-type: none"> <li>Check zero gas in use.</li> <li>Check analysis cell and windows for contamination.  Cleaning of contaminated parts (see chapter 24.3).</li> <li>Switch off the tolerance check before starting an adjustment (see chapter 8.6).</li> </ol>
 Channel 1  Channel 2  Tolerance error  Span-gas value differs more than 10% from nominal value.	<ol style="list-style-type: none"> <li>Incorrect nominal value.</li> <li>Incorrect span gas in use.</li> <li>IR channel: Photometer section contaminated.</li> <li>Analyzer not calibrated.</li> </ol>	<ol style="list-style-type: none"> <li>Enter the correct nominal value (certification of span gas bottle) (see chapter 9.1.2).</li> <li>Check span gas in use.  Use another or a new gas bottle.  Enter the correct nominal value</li> <li>Check analysis cell and windows for contamination.  Cleaning of contaminated parts (see chapter 24.3).</li> <li>Switch off the tolerance check before starting an adjustment (see chapter 8.6).</li> </ol>
 Channel 1  Channel 2  Measuring value more than 10% over full-scale range.	<ol style="list-style-type: none"> <li>Concentration of measuring gas too high.</li> </ol>	<ol style="list-style-type: none"> <li>Check concentration of measuring gas.  Use another analyzer suitable for the concentration-range involved.</li> </ol>

Error Code	Possible Reasons	Check / Correct
	Time out for XON of serial interface.	At drive of serial interface XON - character is absent (Time - out > 60 s).
 Pressure sensor defective	<ol style="list-style-type: none"> <li>1. Measuring range failure.</li> <li>2. Connection faulty.</li> <li>3. Pressure sensor faulty.</li> </ol>	<ol style="list-style-type: none"> <li>1. pressure not into the sensor measuring range (800 - 1,100 hPa).</li> <li>2. Check connection P1 (at BAF 01) / pressure sensor (see chapter 18.).</li> <li>3. Exchange pressure sensor.</li> </ol>
 EPROM Checksummary defective	<ol style="list-style-type: none"> <li>1. EPROM faulty.</li> <li>2. BKS faulty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Exchange EPROM (see chapter 28.).</li> <li>2. Exchange BKS.</li> </ol>
 Test for RAM - IC's defective	RAM IC's / BKS faulty.	Exchange BKS.
<b>Analog output absent</b>	BKS faulty.	Exchange BKS.
<b>Fluctuating or erroneous display</b>	<ol style="list-style-type: none"> <li>1. Leakage into gas circuit.</li> <li>2. Ambient air contains gas constituent to be measured in excessive concentration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform a leakage check. (see chapter 22.).</li> <li>2. Replace absorber material for the light sources and chopper housing.</li> </ol> <p>Use sealed photometer (Option).</p> <p>Flush out the analyzer.</p>



Error Code	Possible Reasons	Check / Correct
<p style="text-align: center;"><b>Fluctuating or erroneous display</b></p>	<p>3. Gas pressure subject to excessive fluctuations.</p>	<p>3. Check the gas lines preceding and following the sensor cell.</p>
		<p>Eliminate any restrictions found beyond the gas outlet fitting.</p>
		<p>Reduce pumping rate or flow rate.</p>
	<p>4. Oxygen sensor / detector not connected.</p>	<p>4. Check connections: BKS X5 / Oxygen sensor (detector channel 1) BKS X6/detector channel 1 (channel2) (see 18.).</p>
	<p>5. Electrochemical oxygen sensor is already consumed.</p>	<p>5. Exchange sensor (see 25.)</p>
	<p>6. IR channel: Light source not connected or faulty.</p>	<p>6. Checkconnection: BKS X3(1/2)/light source channel 1 BKS X3(4/5)/light source channel 2 (see 18.)</p> <p>Light source is cold: For dual IR channel analyzer interchange the two light-sources.</p> <p>Replace the suspect light source (see 24.2).</p>
	<p>7. Faulty analog preamplifiering.</p>	<p>7. Check measuring point 17.1.7 or 17.2.1 resp.</p>
	<p>8. Contamination of the gas paths.</p>	<p>8. Check analysis cell and windows for contamination.</p> <p>Cleaning of contaminated parts (see 24.3).</p> <p>Check gas paths and gas conditioning to contamination.</p>

Error Code	Possible Reasons	Check / Correct
<p style="text-align: center;"><b>Fluctuating or erroneous display</b></p>	<p>9. Barometric pressure effects.</p>	<p>9. Enter the correct value for barometric pressure (see chapter 8.1). Pressure sensor faulty (E.37).</p>
	<p>10. Temperature below the dew point in the gas paths.</p>	<p>10. Check the temperature of the gas paths and eliminate any reason of condensation,</p> <p>Maintain all temperatures at values at least 10 °C above the dew point of sample gas.</p>
	<p>11. Faulty A/D converter.</p>	<p>11. Exchange BKS.</p>
<p><b>Response - time too long</b> (<math>t_{90}</math> - time)</p>	<p>1. Incorrect response time (<math>t_{90}</math> time) settings.</p> <p>2. Pumping rate inadequate.</p> <p>3. Contamination of the gas paths.</p>	<p>1. Check the value for <math>t_{90}</math> time (see chapter 8.11).</p> <p>2. The feeder line between the sampling point and the analyzer is too long. Use a larger, external pump; consider adding a bypass line to the process stream for sampling purposes (see chapter 5.1).</p> <p>3. Check gas paths and gas conditioning to contamination.</p> <p>Clean gas paths and exchange the filter elements.</p>

Error Code	Possible Reasons	Check / Correct
<b>No gas flow</b>	<ol style="list-style-type: none"> <li>1. Needle valve is not opened (Option)</li> <li>2. Sample gas pump (Option) is not switched on</li> <li>3. Membrane of pump is defective</li> <li>4. Sample gas pump is defective</li> <li>5. Solenoid valves defective (Option)</li> <li>6. Contamination of the gas lines</li> </ol>	<ol style="list-style-type: none"> <li>1. Open needle valve (Option, see Fig. 1-2)</li> <li>2. Press key PUMP</li> <li>3. Exchange membrane of the pump.</li> <li>4. Exchange sample gas pump</li> <li>5. Check the valve face of the solenoid valves and exchange if necessary.  Exchange solenoid valves</li> <li>6. Check gas lines including filters to contamination.  Clean the gas lines and exchange the filter elements.</li> </ol>



## 17. Measuring Points of BKS and OXS



Be sure to observe the safety measures !

### 17.1 Measuring points of BKS

All measuring points are measured against ground (X 11 / X 28 or X 29) !

#### 17.1.1 Supply Voltage + 6 V

Measuring point: X 14  
 Measuring device: DVM  
 Signal: + 6 V DC (+10 / -200 mV)  
 (adjust with Potentiometer R 90, if necessary)

Failure: No signal

- Possible reasons:
- a) Voltage supply is absent.
  - b) Voltage supply < 9 V or polarity reversal
  - c) BKS faulty.

#### 17.1.2 Reference Voltage positive

Measuring point: X 10  
 Measuring device: DVM  
 Signal: + 5,535 V DC ( $\pm 60$  mV)

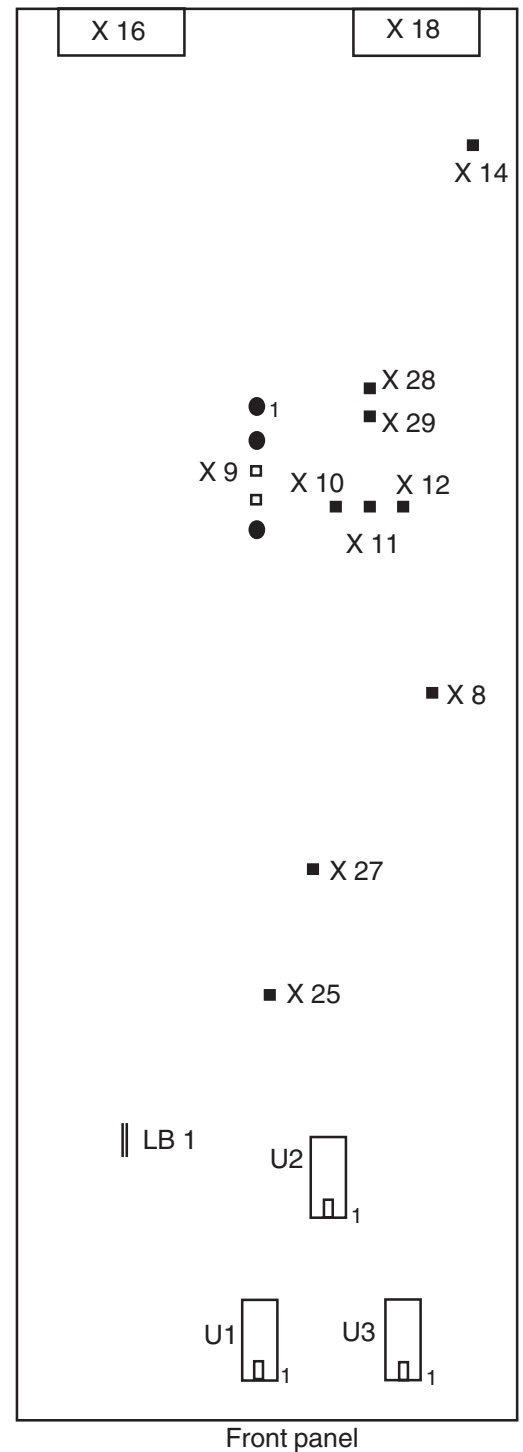


Fig. 17-1: PCB "BKS", measuring points  
 (principle drawing)

### 17.1.3 Reference Voltage negative

Measuring point: X 12

Measuring device: DVM

Signal: inverse [reference voltage positive]

The difference between negative reference voltage and positive reference voltage must be no more than 10 mV ( $U_{\text{ref. pos.}} + U_{\text{ref. neg.}} \leq \pm 10 \text{ mV}$ ) !

If the difference is bigger, exchange BKS.

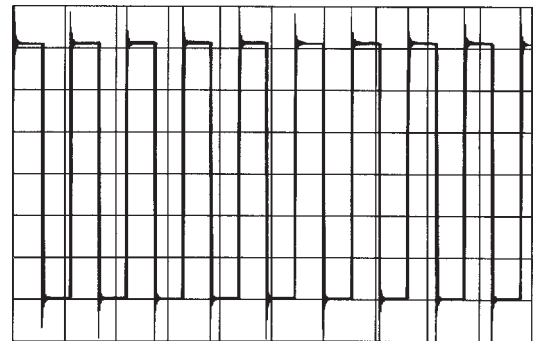
### 17.1.4 Motor Drive (for IR channel only)

Measuring point: LB 1

Measuring device: Oscilloscope

Signal: square impuls  $U = 6 V_{\text{SS}} (\pm 0,3 V)$   
frequency = 1152 Hz ( $\pm 20 \text{ Hz}$ )

Failure: No signal or incorrect frequency



Possible reasons: a) internal 6 V DC absent (see chapter 17.1.1)

b)  $\mu\text{P}$  do not work:

1. Is the EPROM insert correctly ? (see chapter 28)
2. Perform a RESET (see chapter 8.14).
3. BKS faulty (exchange BKS).

### 17.1.5 Temperature Sensor

Measuring point: X 8

Measuring device: DVM

Signal: approx.  $0 \pm 500$  mV DC (at ambient temperature)

Failure: Signal > + 3,5 V DC

Possible reasons (IR measurement or paramagnetic oxygen measurement):

- a) Temperature sensor not connected (see chapter 18.1).
- b) Temperature sensor faulty (exchange sensor).
- c) Broken cable of temperature sensor (exchange sensor).
- d) BKS faulty (exchange BKS).

Possible reasons (electrochemical oxygen measurement):

- a) Temperature sensor not connected (see chapter 18.2).
- b) PCB OXS faulty (exchange OXS).
- d) PCB BKS faulty (exchange BKS).

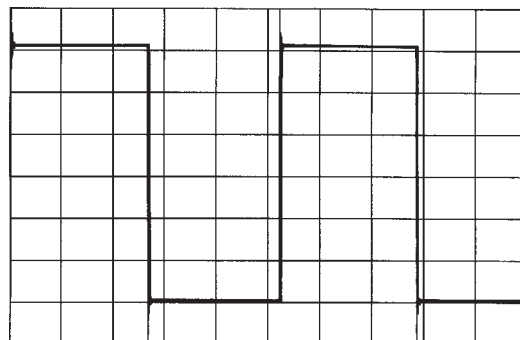
### 17.1.6 Light Barrier Signal

Measuring point: Plug 9, pin 2

Measuring device: Oscilloscope

Signal: square impulse  $U = 6 V_{SS} (\pm 0,3 V)$

Frequency = 24 Hz ( $\pm 0,1$  Hz)



Failure: No signal

Possible reasons (IR measurement):

- a) Chopper not connected (see chapter 18.1).
- b) Chopper inoperative (switch analyzer off and then on again).
- c) Light barrier not connected (see chapter 18.1).
- d) Broken cable of light barrier or faulty light barrier (exchange chopper).
- e) BKS faulty (exchange BKS).

Possible reasons (oxygen measurement without IR channel):

- a) Solder bridge LB 18 not closed.
- b) BKS faulty (exchange BKS).



### 17.1.7 Analog Preamplifiering

#### a) paramagnetic oxygen measurement

Measuring point: X 25 channel 1

Measuring device: DVM

Signal: At zero gas purge: 0 V dc ( $\pm 50$  mV)  
At ambient air (approx. 21 Vol. - % O<sub>2</sub>): 500 mV dc ( $\pm 50$  mV)

Failure: No signal or incorrect measuring values.

Possible reasons: a) oxygen sensor not connected (see chapter 18.).  
b) oxygen sensor faulty (exchange sensor).  
c) BKS faulty (exchange BKS).

#### a) IR measurement

Measuring point: X 25 channel 1 (not for analyzer with oxygen measurement)  
X 27 channel 2

Measuring device: DVM

Signal: At zero gas purge: 0 V dc ( $\pm 100$  mV)

There should be a minimum difference of 600 mV  
(measuring ranges < 1000 ppm difference 500 mV) between  
zeropoint voltage and sensitivity voltage.

Failure: No signal or incorrect measuring values.

Possible reasons: a) Detector not connected (see chapter 18.).  
b) Detector faulty (exchange detector).  
c) BKS faulty (exchange BKS).

**17.2 Measuring points of OXS (electrochemical oxygen measurement)**

**17.2.1 Sensor Signal**

Measuring device: DVM

Measuring point: Tp 1 (Signal)  
Tp 2 (⊥)

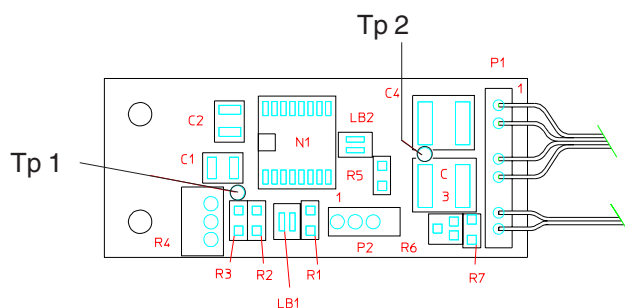
Signal: At ambient air (approx. 21 Vol. - % O<sub>2</sub>): 700 mV to 1000 mV

Failure: No signal or faulty voltage

- Possible reasons:
- a) Oxygen sensor not connected to PCB "OXS"
  - b) PCB "OXS" not connected / faulty
  - c) Oxygen sensor faulty or consumed
  - d) BKS faulty

**Note !**

If the measuring value is lower than < 700 mV at gas flow with ambient air, the sensor is consumed. Exchange the sensor.



**Fig. 17-2: PCB "OXS", assembled, horizontal projection**

## 18. Plug Pin Allocation of Printed Circuit Boards



Be sure to observe the safety measures !

### 18.1 Plug Pin Allocation of BKS

P 1 or P2	24 V DC supply to optional internal consumer (heater of paramagn. O <sub>2</sub> sensor e.g.)
X 1	Front panel BXF (P8)
X 16	Digital Outputs, parallel
X 18	Analog Outputs
J 9	Option BSI 10: Status signals and serial interface resp.
X 36/ D 30	Option BAF 01: Pressure sensor PCB
P 1	at Option BAF 01: Connector for pressure sensor

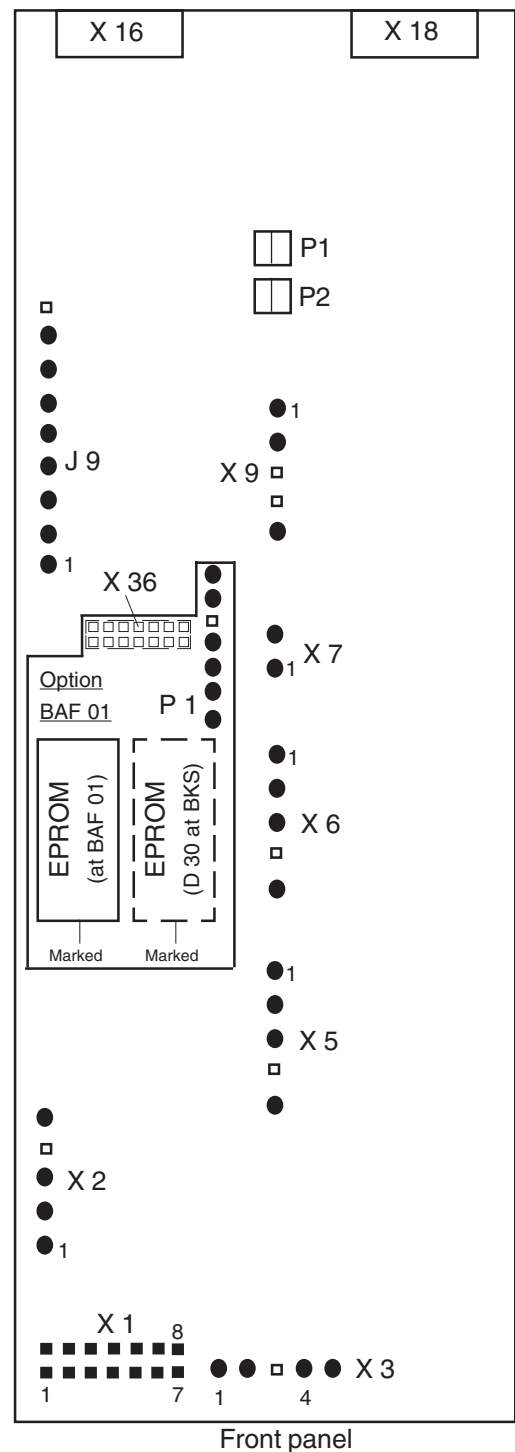


Fig. 18-1: PCB "BKS", Plug Pin Allocation  
 (principle drawing)

### 18.1.1 IR measurement without oxygen channel

X 2		Chopper
X 3	(4/5)	Light source channel 1
X 3	(1/2)	Light source channel 2
X 5		IR detector (channel 1)
X 6		IR detector (channel 2)
X 7		Temperature sensor (chopper)
X 9		Light barrier (chopper)

### 18.1.2 Oxygen Measurement without IR channel

X 5		Oxygen sensor (channel 1) [at electrochemical measurement: PCB OXS (cable P1, 5 pin connector)]
X 7		Oxygen sensor (channel 2) [at electrochemical measurement: PCB OXS (cable P1, 5 pin connector)]
X 7		Temperature sensor [at electrochemical measurement: PCB OXS (cable P1, 2 pin connector)]

### 18.1.3 IR / Oxygen Measurement combined

X 2		Chopper
X 3	(4/5)	Light source channel 2
X 5		Oxygen sensor
X 6		IR detector (channel 2)
X 7		Temperature sensor (chopper)
X 9		Light barrier (chopper)

### 18.1.4 TC Measurement without IR channel

**In preparation !**

### 18.1.5 IR / TC Measurement combined

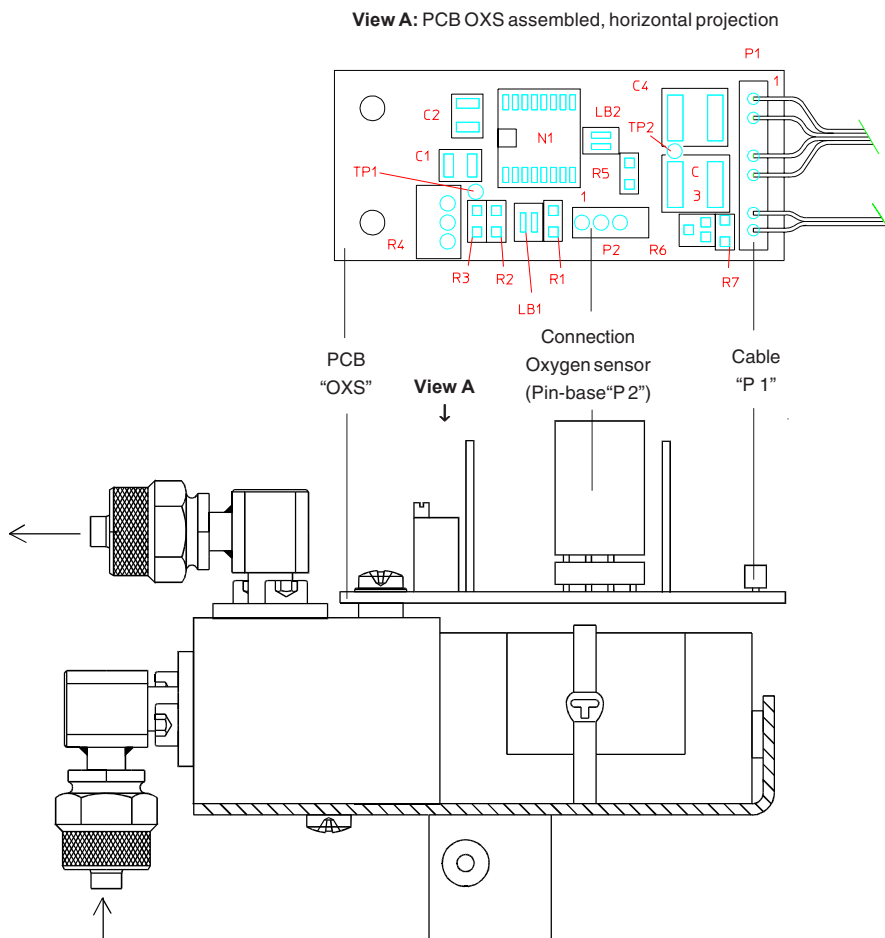
X 2		Chopper
X 3	(4/5)	Light source channel 2
X 5		TC sensor (from PCB WAP 100, cable P15, 5 pin connector))
X 6		IR detector (channel 2)
X 7		Temperature sensor (chopper)
X 9		Light barrier (chopper)

### 18.1.6 Oxygen / TC Measurement combined

**In preparation !**

**18.2 Plug Pin Allocation OXS (electrochemical oxygen measurement only)**

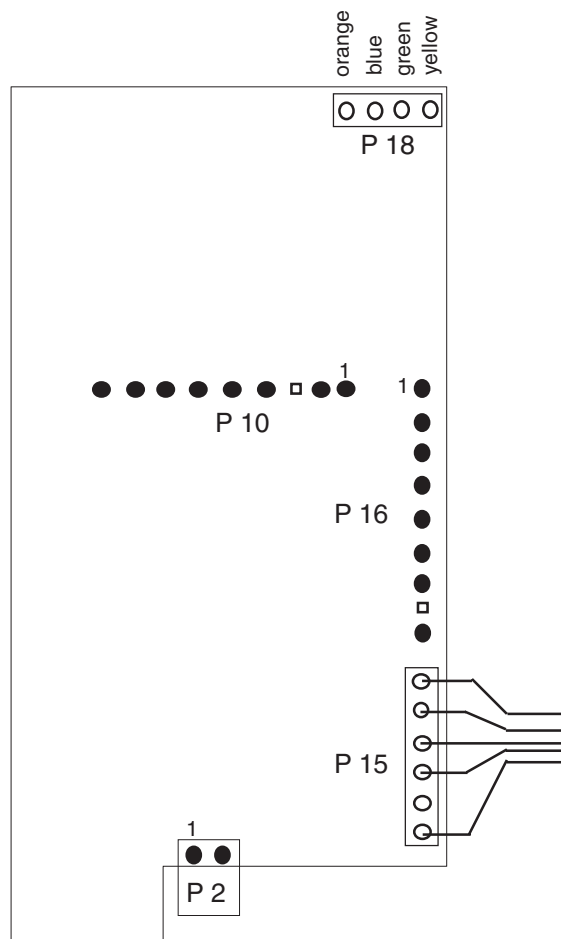
Pin base P2	Oxygen sensor
Cable P1, 5 pin connector	PCB BKS, X 5 (sensor signal)
Cable P1, - pin connector	PCB BKS, X 7 (temperature sensor) (not used for combination with IR measurement)



**Fig. 18-2: PCB "OXS"**

### 18.3 Plug Pin Allocation WAP 100 (TC measurement only)

P2	24 V DC supply from PCB BKS (P1 or P2)
Terminals P 18	to sensor
Cable P15, 5 - pin connector	PCB BKS, X 5 (sensor signal)
P 16	heater of sensor
P 10	PCB BSE 01 (analog input for cross compensation)



**Fig. 18-3: PCB "WAP 100", Plug Pin Allocation**  
 (principle drawing)



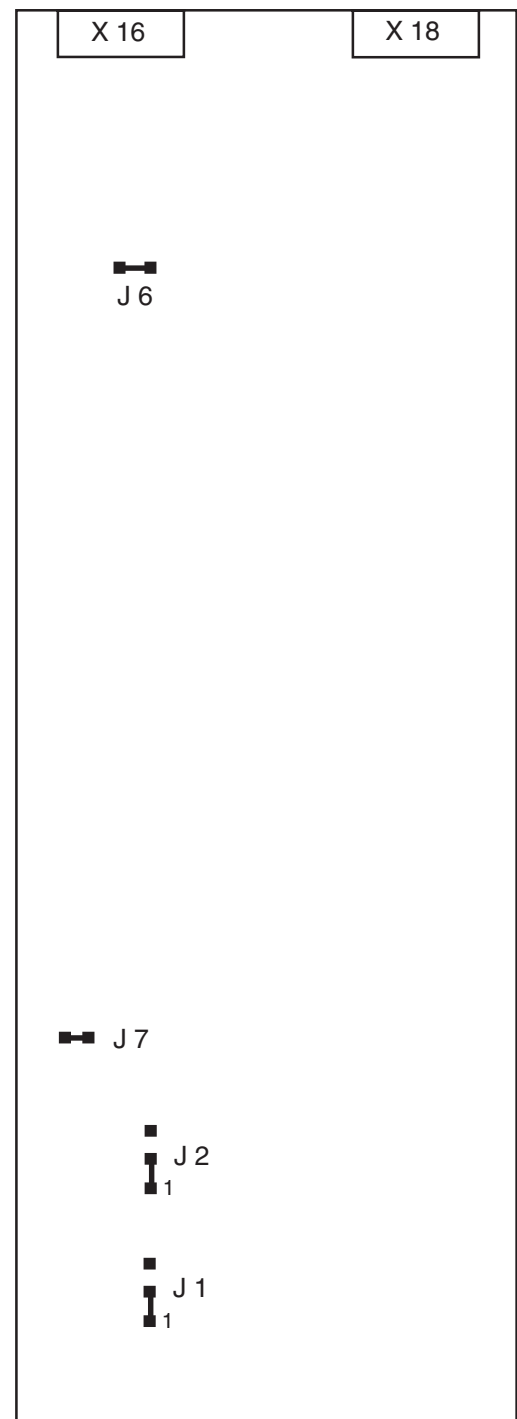
## 19. Jumper Allocation of BKS

J 1 A/D conversion start channel 1

J 2 A/D conversion start channel 2  
 (open for 1 channel analyzer)

J 6 Watchdog signal

J 7 Buffer Battery



Front panel

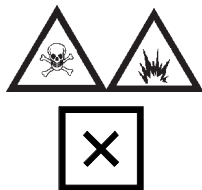
**Fig. 19-1: PCB "BKS", Jumper Allocation**  
 (principle drawing)



## 21. Fine Dust Filter (Option)



The optional fine dust filter (see Fig. 1-2) should be checked in intervals appropriate to the type of process and application. If the filter element shows contamination, the element should be replaced immediately with a new unit.



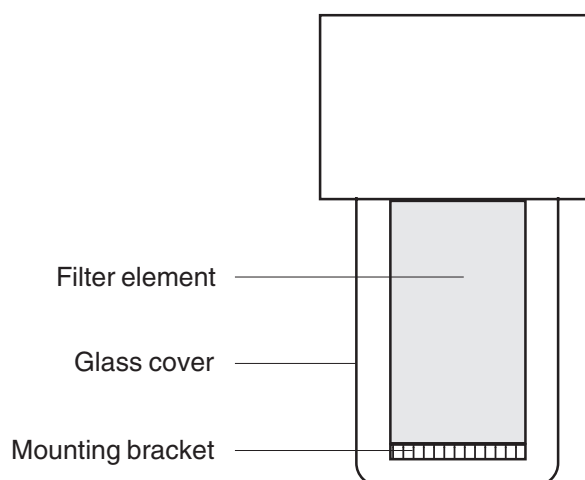
To avoid risks by explosive, toxic or unhealthy gas components purge the gas lines with ambient air or nitrogen ( $N_2$ ) before cleaning or replacing parts of the gas paths.

- Remove the glass filter cover and unscrew the mounting bracket (switch off optional gas sampling pump before).
- Replace contaminated filter element, using only **new** units (Order - No.: 42 707 676). Dispose contaminated filter elements in accordance with applicable regulations.



Filter elements are single-use disposable items !  
Do not clean and replace used filter elements; use new replacements only !

- Reinstall mounting bracket and close filter with the glass cover (see Fig. 21-1).
- Perform a leak testing (see Item 22.)



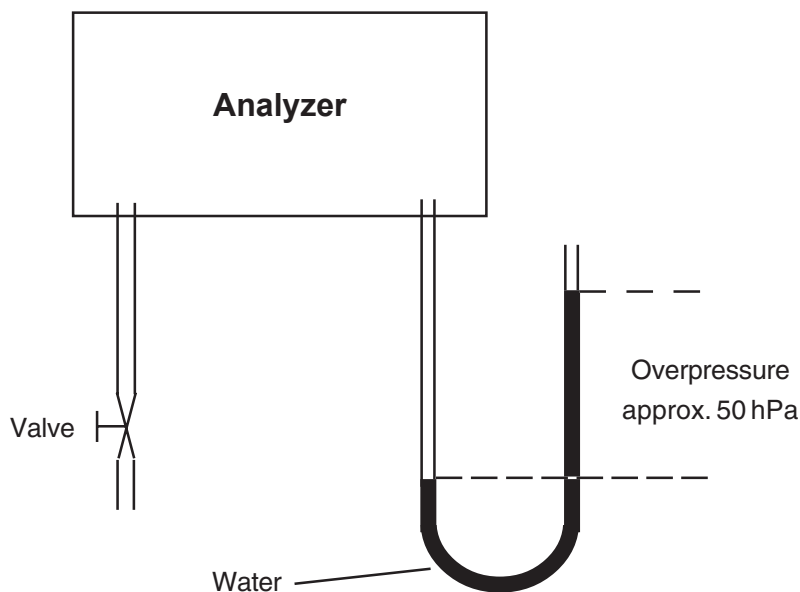
**Fig. 21-1: Fine Dust Filter**



## 22. Leak Testing



Testing for gas leakage should be performed at bimonthly intervals and always immediately after any repair or replacement of gasline components is performed. The test procedure is as follows:



**Fig. 22-1: Leak Testing with an U - Tube - Manometer**

- Install a waterfilled U - tube manometer at the sample gas outlet;
- Install a shut-off valve at the sample gas inlet.  
Admit air into the instrument at the shut-off valve until the entire analyzer is subjected to an overpressure of 50 hPa (approximately 500 mm water column; see Fig. 22-1).

Close the shut-off valve and verify that following a brief period required for pressure equilibrium, that the height of the water column does not drop over a period of about 5 minutes.

Any external devices, such as sample gas cooling hardware, dust filters etc., should be checked in the course of leak testing.



**Overpressure max. 500 hPa !**

For analyzers with parallel gas paths leak testing must be performed for each gas path separately !

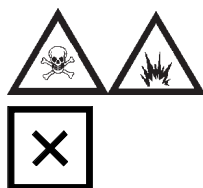


## 23. Housing

### 23.1 Cleaning of Housing Surface

For cleaning the analyzer housing surface use a soft, fluff free cloth and all purpose detergent.

- Disconnect all voltage supplies.



To avoid risks by explosive, toxic or unhealthy gas components, first purge the gas lines with ambient air or nitrogen (N<sub>2</sub>) before cleaning or replacing parts of the gas paths.



If it is necessary to disconnect the gas connections, the gas line fittings of the analyzer have to be closed with PVC-caps before cleaning to avoid pollution!

- Moisten the soft, fluff free cloth with the cleaning solution (mixture of 3 parts water, 1 part all purpose detergent max.).



Be sure to use a moisted, but not wet cloth only !  
Be sure, that no liquid can drop into the housing inside !

- Clean the analyzer housing surface with the damped cloth.
- If required, rub off the housing, but not the front panel, with a dry cloth afterwards.

## 23.2 Opening the Housing

The housing must be opened for checking the electrical connections and for replacement or cleaning of any of the internal components of the analyzer.



Be sure to observe chapter VIII. of the safety measures !

### 23.2.1 1/4 19" Housing

- Disconnect all voltage supplies.
  
- Table-top analyzers only
  - \* Remove the rubber feet.
  - \* Unscrew the screws shown in Fig. 1-1, Item 8.
  - \* Remove the front mounting frame and carrying strap to rear.
  
- Unscrew the screws shown in Fig. 1-1, Item 7 and Figs. 1-5 and 1-6, Item 6.
  
- Remove the analyzer housing top cover panel.

Closing the housing is performed in reverse order.

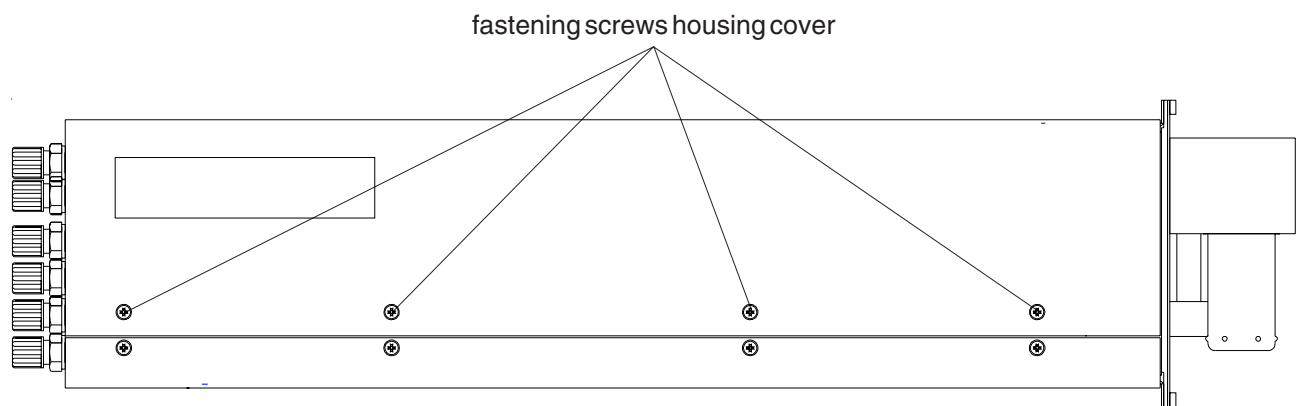


## 23.2.2 BINOS® 100 2M

### a) Housing Cover

- Disconnect all voltage supplies.
- Unscrew fastening screws for rack mounting / front frame if necessary (Fig. 1-2, Item 11). Remove analyzer out of rack or remove the front mounting frame and carrying strap to rear.
- Unscrew the respective fastening screws at both housing sides (Fig. 23-1)
- Remove the respective housing top cover panel.

Closing the housing is performed in reverse order.



**Fig. 23-1: BINOS® 100 2M**  
(Fastening screws housing cover)

**b) Front Panel**

- Opening housing cover (Item 23.2.2 a).
- Unscrew the 6 fastening screws at both housing sides (Fig. 23-2)
- Remove front panel to the front carefully.

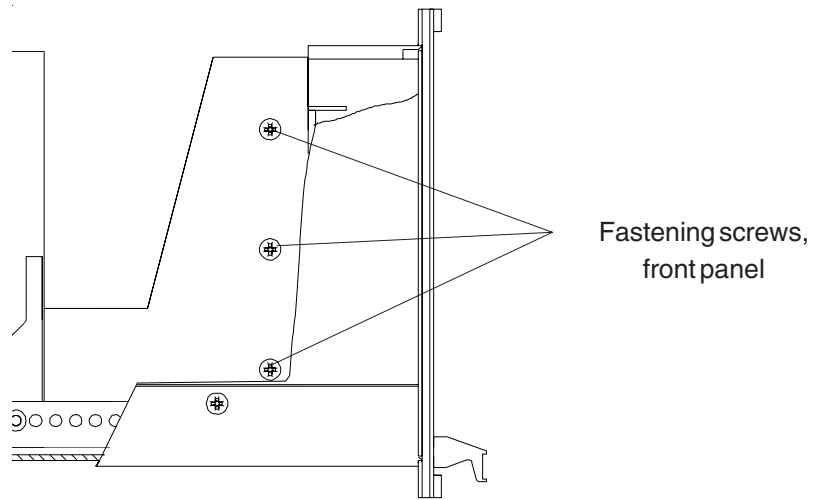


If the optional components fine dust filter and flow meter are mounted at front panel - take care of gas lines (see Fig. 1-2) !

Closing the housing is performed in reverse order..



Do not squeeze gas lines !



**Fig. 23-2: BINOS® 100 2M**

*(Fastening screws front panel, viewed without options filter and flow sensor)*

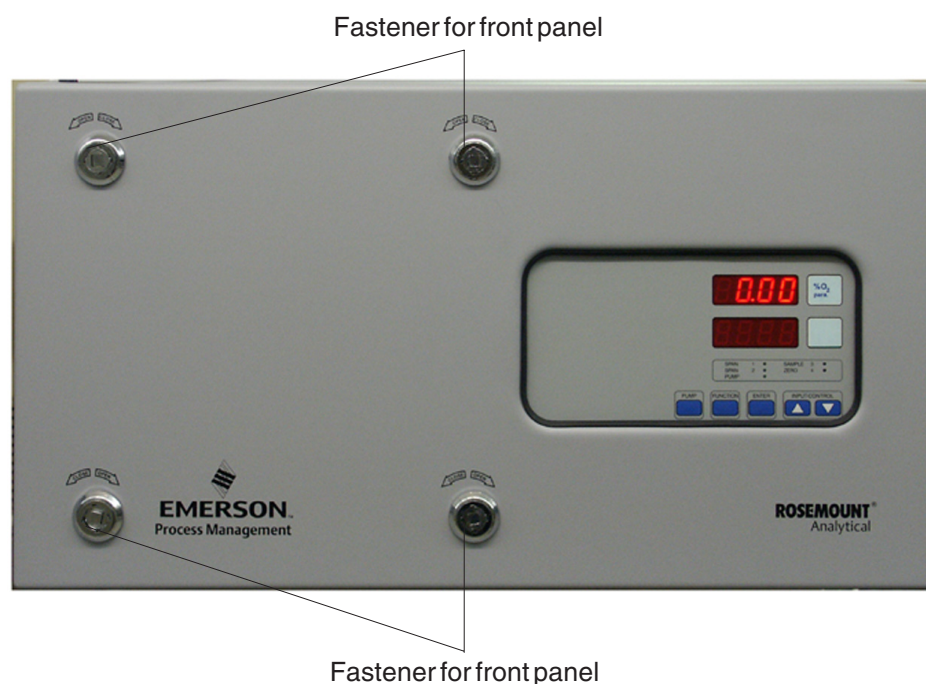
### 23.2.3 BINOS® 100 F (Field Housing)

- Open all 4 fasteners with a square key (Fig. 23-3)
- Carefully swing out the front panel to the right side.
- Pull out the photometer slide-in cart to the front carefully.



Photometer components may be hot!

Closing the housing is performed in reverse order.



**Fig. 23-3: BINOS® 100 F (Field housing) (fastener for front panel)**

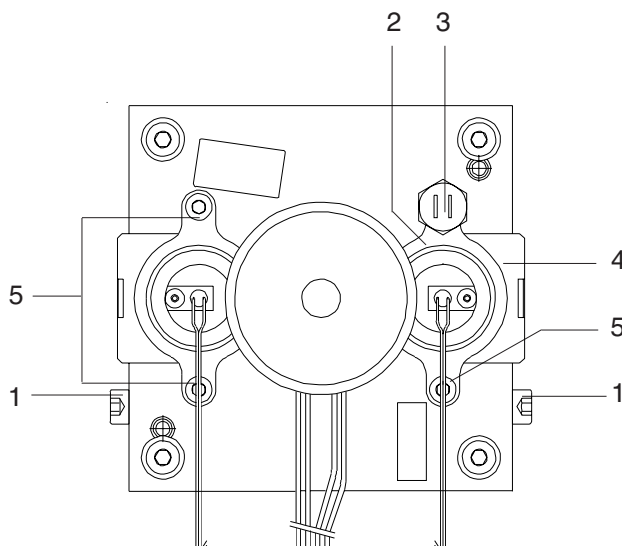


## 24. Replacement and Cleaning of Photometric Components

### 24.1 Taking out the Photometer Assembly



- Open the analyzer housing (cf. chapter 23).
- Disconnect all electrical connections between photometer assembly and electronic unit and disconnect all gas lines from the photometer assembly.
- *Only analyzers with gas detector:*  
Remove preamplifier (Fig. 3-2, Item 5) from holding device (Fig. 3-2, Item 4).
- Remove the two screws shown in Fig. 24-1 as Item 1.
- Take the photometer assembly out of the analyzer housing.



**Fig. 24-1: Analyzer Photometer Assembly**  
(2 channel IR analyzer, viewed from the front panel side)

- 1 Fastening screw, photometer assembly mounting bracket
- 2 Light source with mounting flange
- 3 Temperature sensor
- 4 Zero level adjustment baffle (not for sealed version)
- 5 Light source mounting screw

## 24.2 Light Source Replacement



- Open the analyzer housing (cf. chapter 23).
- Take the photometer assembly out of the analyzer housing (see chapter 24.1).
- Remove the two light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp.
- Remove the light source together with its mounting flange.
- Remove the mounting flange from the light source and position it on the new light source.
  - *For sealed version with pyroelectrical detector only:*  
Remove the tight baffle (zero level adjustment baffle) from the light source and position it in the new light source.
  - *For sealed version only:*  
Place the O-rings on the adapter cell and filter cell.
- Insert the new light source and flange in the same position as the old one.
- Insert and tighten the two light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp.
- Reinstall the photometer assembly (see chapter 24.5).
- Perform the physical zeroing procedure (see chapter 24.6).

## 24.3 Cleaning of Analysis Cells and Windows

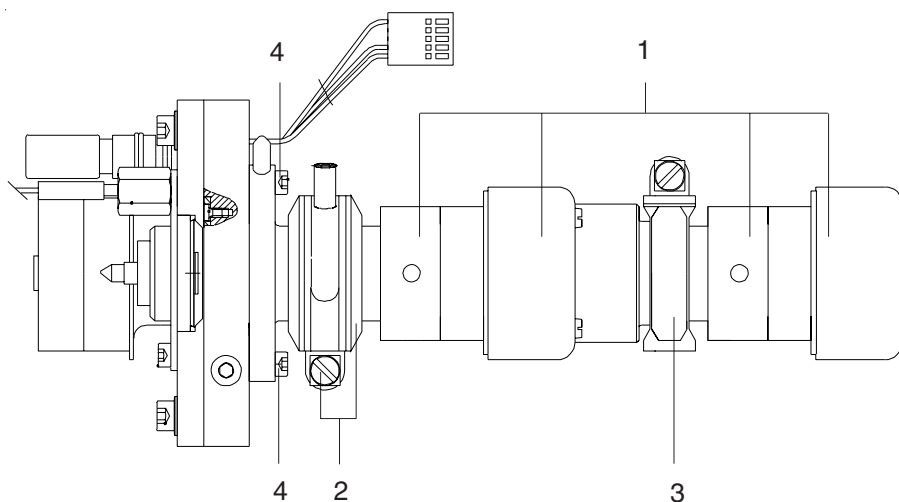
### 24.3.1 Removal of Analysis Cells



- Open the analyzer housing (cf. chapter 23).
  - Take the photometer assembly out of the analyzer housing (see chapter 24-1).
- a) For analysis cells of lengths 1 mm and 7 mm
- Remove the clamp (Fig. 24-2, Item 2).
  - Remove the clamping collar and the filter cell with signal detector assembly.
- b) For analysis cells of lengths 50 mm - 200 mm:
- Remove the clamp (Fig. 24-2, Item 3).
  - Remove the filter cell with signal detector assembly.
  - Remove the mounting screws shown in Fig. 24-2, Item 4.
  - Remove the analysis cell body from the chopper housing.

*Only analyzers with gas detector:*

- Remove preamplifier from analysis cell



**Fig. 24-2: Photometer Assembly** (2 channel photometer, side view)

- 1 Filter cell with signal detector assembly
- 2 Clamp with clamping collar
- 3 Clamp
- 4 Mounting screws for analysis cells of lengths 50 - 200 mm

### 24.3.2 Cleaning

#### a) Windows

The windows on the filter cell, chopper housing, the adapter cell resp. analysis cell may be cleaned with a soft, lint-free cloth.

Use a highly volatile alcohol for the cleaning procedure.

To remove any remaining lint and dust particles, blow off the cleaned components with nitrogen ( $N_2$ ).

#### b) non-divided analysis cells

The analysis cell may be cleaned with a soft, lint free cloth.

Use a highly volatile alcohol for the cleaning procedure.

To remove any remaining lint and dust particles, blow off analysis cell with nitrogen ( $N_2$ ).

#### c) divided analysis cells

If pollution is visible in the analysis cell, it can be removed with suitable solvents e. g. acetone or spirit. Afterwards the analysis cell has to be flushed with an alcohol which evaporates easily and dried by blowing nitrogen ( $N_2$ ).



Max. pressure in analysis cell 1,500 hPa !



### 24.3.3 Reinstalling the Analysis Cells

- a) For analysis cells of lengths 1 mm and 7 mm
- Place the O-rings on the adapter cell and filter cell.
  - Fit the components together.
  - Install the clamping collars with the clamp and tighten it.
- b) Analysis cells of lengths 50 mm - 200 mm:
- Place the O-ring on the chopper housing side of the cell body.
  - Position the cell body in place and fasten it using the two mounting screws (Fig. 24-2, Item 4).
  - Place the O-ring on the filter cell.
  - Fit the filter cell on the cell body.
  - Install the clamp and tighten.

*Only analyzer with gas detector:*

- Assembly preamplifier to analysis cell

Then:

- Reinstall the photometer assembly (see chapter 24.5).

## 24.4 Chopper Replacement

- Open the analyzer housing (cf. chapter 23).
- Take the photometer assembly out of the analyzer housing (see chapter 24.1).
- Remove the light source(s) from chopper housing (see chapter 24.2).
- Remove the analysis cell(s) from chopper housing (see chapter 24.3.1).
- Remove the analysis cell(s) from chopper housing (see chapter 24.3.1).
- Reinstall the analysis cell(s) to new chopper housing (see chapter 24.3.3).
- Insert the light source(s) to new chopper housing (see chapter 24.2).
- Reinstall the photometer assembly (see chapter 24.5).

## 24.5 Reinstalling of the Photometer Assembly



- Insert the photometer assembly into the analyzer housing and fasten in position using the mounting bracket screws (Fig. 24-1, Item 1).
  - *Only analyzers with gas detector:*  
Insert preamplifier (Fig. 3-2, Item 5) to holding device (Fig. 3-2, Item 4).
- Reconnect all gas lines to the assembly.
- Reconnect all electrical connections between the photometer assembly and the electronic unit (see chapter 18.).
- Perform a leakage test (see chapter 22).
- Perform the physical zeroing procedure (see chapter 24.6).

## 24.6 Physical Zeroing

Adjustment of the physical zero - level will only be required if a light source, a filter cell, or an analysis cell have been replaced or repositionned.



Be sure to observe the safety measures !

Take care of the photometer temperature: Photometers heat up when powered!

Needed for the adjustment are a digital voltmeter (DVM) with a range of 2 VDC and a 3 mm hexagon wrench SW 3.

- Switch on the analyzer (cf. chapter 6).
- Admit zero gas to the analyzer.
- Connect the DVM to the measuring points:

X 25 and X 28 ( ⊥ ) for channel 1 (IR measurement only).

X 27 and X 28 ( ⊥ ) for channel 1 (Combined Oxygen / IR measurement).  
channel 2 (IR measurement only).

Depending on the installed photometer model continue with step 24.6.1 or 24.6.2

### 24.6.1 Standard Photometer (not sealed version)

- Slightly loosen the light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp. for channel 1 or channel 2.
- Set the zero level precisely to 0 V (± 100 mV) by turning the corresponding light source. If the turning of the light source is not sufficient, the zero point can be adjusted by sliding the zero level adjustment baffle (Fig. 24-1, item 4).
- Tighten the light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp. for channel 1 or channel 2.

When the physical zeroing has been correctly set, perform an electrical zeroing (see chapter 9.).

### 24.6.2 Sealed Photometer (Option)

- Slightly loosen the light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp. for channel 1 or channel 2.
- Set the zero level precisely to 0 V ( $\pm 100$  mV) by turning the corresponding light source.
  - *For photometer with pyroelectrical detector only:*  
To enable physical zero level adjustment, one out of three different fix apertures (zero level adjustment aperture) are installed inside the light source.  
For simple replacement the aperture is fixed inside the source with a magnet.  
If turning the light source is not sufficient, use another fix aperture (zero level adjustment aperture; see item 24-2) and again turn the light source.
- Tighten the light source mounting screws (shown in Fig. 24-1 as Item 5) or the temperature sensor (shown in Fig. 24-1 as Item 3) resp. for channel 1 or channel 2.

When the physical zeroing has been set correctly, perform an electrical zeroing (see chapter 9.).

## 25. Checking / Replacing an Electrochemical Oxygen Sensor

On account of the measuring principle the oxygen sensor has a limited life time.

The life time of the oxygen sensor depends on the sensor itself and on the measured oxygen concentration and is calculated as follows:

$$\text{life time} = \frac{\text{sensor time (hours)}}{\text{O}_2 \text{ - concentration (\%)}}$$

The so-called “sensor time” (operation without oxygen at 20 °C ) is

approx. 900.000 hours for sensors with a response time of about 12 s

approx. 450.000 hours for sensors with a response time of about 6 s

The sensors have the following life time at approx. 21 % Oxygen and 20 °C :

approx. 42.857 hours (approx. 5 years) for sensors with a response time of about 12 s

approx. 21.428 hours (approx. 2.5 years) for sensors with a response time of about 6 s

### Note !

The values given above are presented as guidelines only. The actual values are depending on operation temperatures (the result of higher temperatures, for example 40 °C, could be the half life time) and measured concentrations.

### Note !

On account of the measuring principle the electrochemical O<sub>2</sub> cell needs a minimum internal consumption of oxygen (residual humidity avoids the cell running dry). Continuously supplying cells with dry sample gas of low grade oxygen concentration or with oxygen-free sample gas could result a reversible change of O<sub>2</sub> sensitivity. The output signal will become unstable.

For correct measurement the cells have to be supplied with O<sub>2</sub> concentrations of at least 0.1 Vol.-%. We recommend to use the cells in intervall measurement (purge cells with conditioned (removal of dust but no drying) ambient air during measurement breaks).

If it is necessary to interrupt oxygen supply for several hours or days, the cell has to regenerate (supply cell for about one day with ambient air). Temporary flushing with nitrogen (N<sub>2</sub>) for less than 1 h (e.g. analyzer zeroing) does not influence the measuring quality.

For analyzers with electrochemical O<sub>2</sub> cell purge all analyzer gas lines with conditioned ambient air before closing the gas line fittings for transport or depositing the analyzer.

## 25.1 Checking the Sensor



Replace the sensor, if the voltage is less than 70 % of the initial output voltage.

The check requires a digital voltmeter (DVM) with a range of 5 V DC.

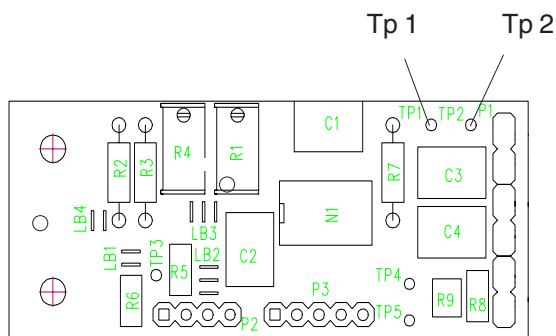
- Open the housing (see chapter 23.).
- Switch On the analyzer (see chapter 6.).
- Supply ambient air to the analyzer (approx. 21 Vol. - O<sub>2</sub>).
- Connect the DVM to the measuring points

Tp 1 (Signal) and Tp 2 (⊥) of the PCB OXS, mounted directly at the connection block (Fig. 25-1, see also Fig. 25-2, 1-11, 1-13, 1-15 to 1-17 and 1-19).

The measuring signal should be in a range of 2,4V DC to 3,36 V DC.

### Note !

If the measuring value is lower than 2,4V at gas flow with ambient air, the sensor is consumed. Replace the sensor.



**Fig. 25-1: PCB "OXS", assembled, horizontal projection**

## 25.2 Replacing the Sensor

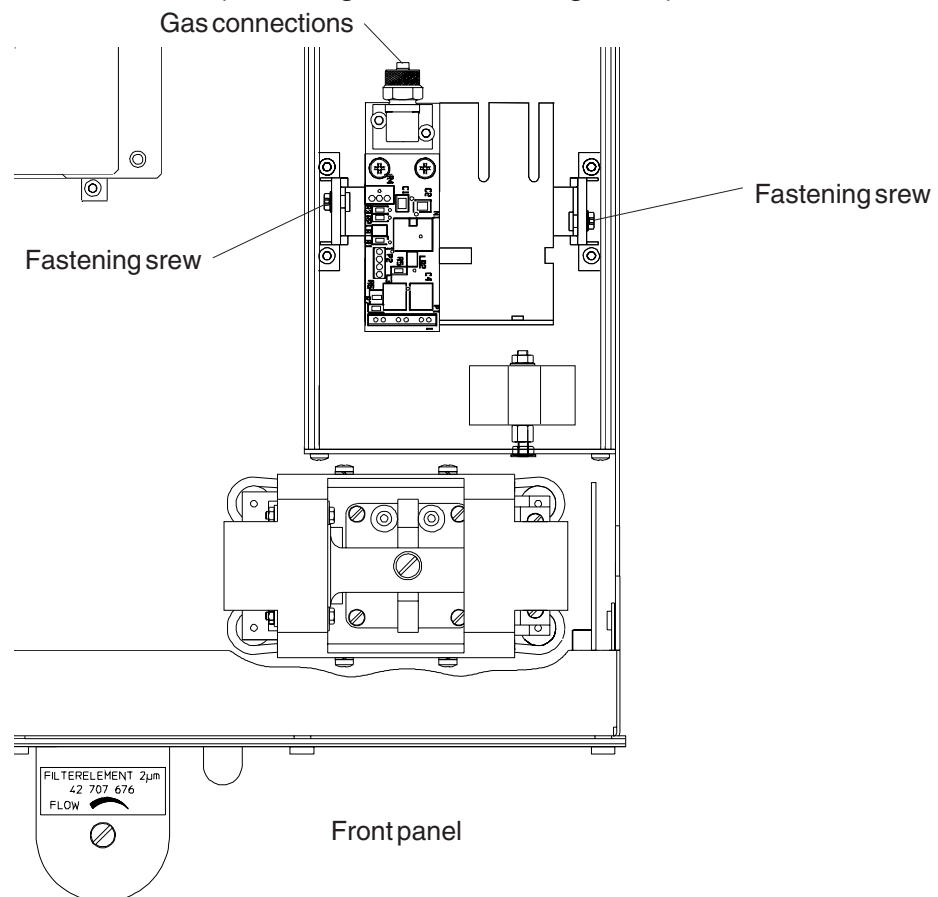


Be sure to observe the safety measures !

### 25.2.1 Remove the old Sensor

#### a) Oxygen Measurement without IR - channel

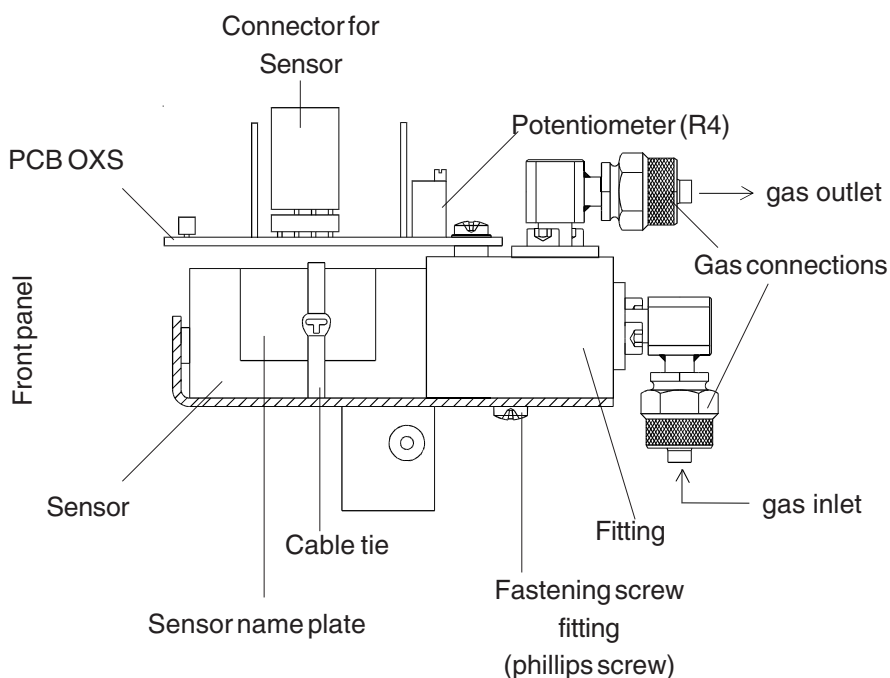
- Open the analyzer housing (see chapter 23.).
- Disconnect all electrical connections between the PCBs OXS and BKS (X5, X6 and X7, see chapter 18.).
- Remove all gas lines from the sensors.
- Unscrew both allen screws (fastening screws, see Fig. 25-2).



**Fig. 25-2: Inside View BINOS® 100 2M**  
(Oxygen Measurement without IR channel, assembly similar in OXYNOS® 100 EO<sub>2</sub>)

**CHECKING AND REPLACING AN ELECTROCHEMICAL OXYGEN SENSOR**  
**REPLACING THE SENSOR**

- Take out the complete support (see Fig. 25-1) to the top of the analyzer.
- Disconnect the connector for the sensor from “P2” of circuit board “OXS” (see Fig. 25-5).
- Cut through the cable tie (see Fig. 25-3).
- Unscrew both fastening screws for the fitting (phillips screws, see Fig. 25-3).
- Remove the fitting including the sensor (see Fig. 25-3).

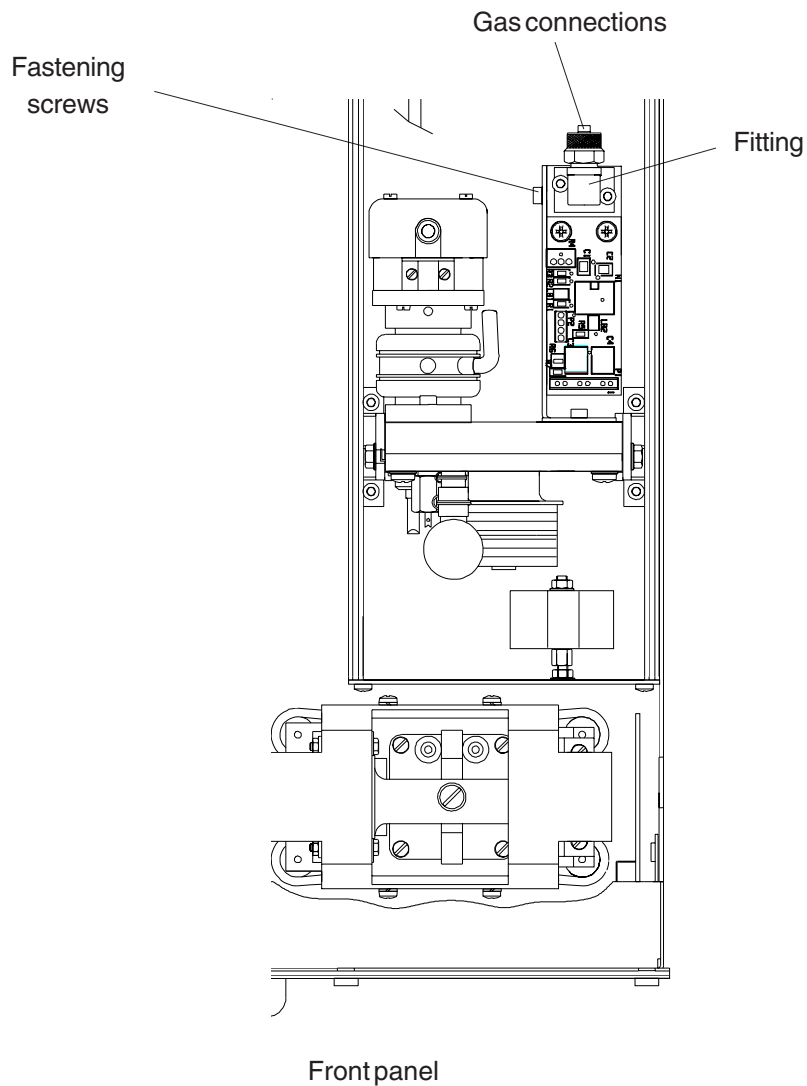


**Fig. 25-3: Sensor support BINOS® 100 2M**  
(Oxygen Measurement without IR channel)



**b) IR / Oxygen Measurement combined**

- Open the analyzer housing (see chapter 23.).
- Disconnect the connector for the sensor from “P2” of circuit board “OXS” (see Fig. 25-5).
- Unscrew both fastening screws for the fitting (see Fig. 25-4) and remove the fitting completely with the sensor.



**Fig. 25-4: Inside View BINOS® 100 2M**  
(combined IR / Oxygen Measurement, assembly similar in BINOS® 100 M)

### **25.2.2 Removing the Sensor**

- Take the consumed sensor out of the fitting.
- Take off the stopper from new sensor and place the new sensor into the fitting, so that the name plate is at the top of the sensor.
- Close the consumed sensor with the stopper and send it back to our factory.

### **25.2.3 Reinstalling the Sensor**

#### **a) Oxygen Measurement without IR - channel**

- Put the fitting with the (new) sensor onto the support, move to the stop and screw with the two fastening screws (phillips screws, see Fig. 25-3)
- Fix the sensor with a cable tie to the support (see Fig. 25-3).
- Connect the connector for the sensor to "P2" of circuit board "OXS" (see Fig. 25-5 / chapter 18.).
- Insert the complete support (see Fig. 25-3) into the analyzer and fix it with the two allen screws (fastening screws, see Fig. 25-2).
- Reconnect all gas lines to the fittings (see Fig. 25-2 and Fig. 25-3).  
Do not interchange gas inlets and gas outlets.
- Reconnect all electrical connections between OXS and BKS (X5 and X7, see chapter 18.).
- Perform a leakage test (see chapter 22.) and set the sensor (see chapter 25.2.4).

#### **b) Combined IR / Oxygen Measurement**

- Put the fitting with the (new) sensor onto the support, move to the stop and fix it with the two fastening screws (see Fig. 25-4)
- Connect the connector for the sensor to "P2" of circuit board "OXS" (see Fig. 25-5 / chapter 18.).
- Perform a leakage test (see chapter 22.) and set the sensor (see chapter 25.2.4).

**25.2.4 Basic settings for the Oxygen Sensor**



- Supply ambient air to the analyzer (approx. 21 Vol. - O<sub>2</sub>) and switch on (see chapter 6.).

- Connect the DVM to the measuring points

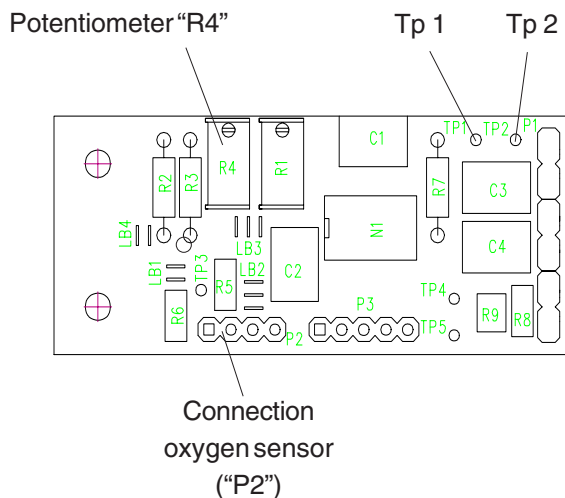
Tp 1 (Signal) and Tp 2 (⊥) of the PCB OXS, mounted directly at the connection block (Fig. 25-1, see also Fig. 25-2, 1-11, 1-13, 1-15 to 1-17 and 1-19).

- Set the signal to 3,36 V DC (± 5 mV) with potentiometer R4 (Fig. 25-5) of the corresponding circuit board “OXS”.

**Note !**

Do not change this setting for this sensor again !

- Switch off the analyzer and close the analyzer housing (see chapter 23.).  
Slide the module into platform if necessary.
- A complete recalibration of the instrument must be performed after a sensor replacement.



**Fig. 25-5: PCB "OXS", assembled, view at component side**



## 27. Technical Data

### Certifications

(for measurement of non flammable gases or non explosive gases resp. (< 50 % LEL).  
Higher concentrations require supplementary protective measures !)

**CE** EN 61326, EN 61010-1

NAMUR, CSA-C/US,  
C-Tick, PAC, GOSSTANDART

**Suitability tests** TÜV Nord mbH, report no.: 95CU054/B,  
TÜV Bavaria, report no.: 1563793,

Carbon monoxide (CO): TI Air, 13<sup>th</sup> BImSchV

Oxygen (O<sub>2</sub>): TI Air, 13<sup>th</sup> BImSchV, 17<sup>th</sup> BImSchV

DMT: IBS/PFG-No. 41300392NIII/41300292NIII

CO<sub>2</sub> / CH<sub>4</sub> : 0-80 Vol.-%

CO : 0-200 ppm / 0-10 Vol.-%

O<sub>2</sub> : 0-10 Vol.-%

For information about the configuration, measuring components and ranges of the actual analyzer refer to the nameplate label, which is located on the left or right side of the analyzer cover (all table top and rack mount versions) or inside the front door (BINOS 100 F).

### How to read a name plate label:

Analyzer type and measuring principles

Channel 1:  
Component and full scale range

Analog output settings

<b>EMERSON</b> Process Management		<b>ROSEMOUNT</b> Analytical	
Typ: BINOS 100 IR IR		SN: 1234567890	
CO: FS 1000ppm	CO2: FS 100ppm		
Signal: 4-20 mA 2-10V			
PFG-Nr. 41300392		Made in Germany	

Serial number

Channel 2:  
Component and full scale range

DMT approval number (if applicable)

### 27.1 Options

Pressure sensor

Fine dust filter (BINOS® 100 2M/F)

Sample gas pump (BINOS® 100 2M/F)

Measuring range 800 - 1,100 hPa

Filter material PTFE, Pore size approx. 2 mm

Pumping rate max. 2.5 l/min.

Suction pressure min. 900 hPa

Lifetime max. 5,000 hours

## 27.2 Housing

Gas connections	Standard 6/4 mm PVDF Option: 6/4 mm or 1/4", ss additional fittings on request
BINOS® (M)/ OXYNOS® / HYDROS® 100	max. 4 fittings
BINOS® 100 2M	max. 9 fittings
BINOS® 100 F (standard version)	max. 6 fittings
Dimensions	see dimensional sketches (Fig. 27-1)
Weight (depending on analyzer configuration)	
BINOS® (M)/ OXYNOS® / HYDROS® 100	approx. 4 - 7 kg
BINOS® 100 2M	approx. 10 - 12 kg
BINOS® 100 F (standard version)	approx. 30 - 35 kg
Protection class	(according to DIN standard 40050)
BINOS® (M/2M)/ OXYNOS® / HYDROS®	IP 20
BINOS® 100 F (standard version)	IP 65 (NEMA4/4X)
Permissible ambient temperature	+ 5 °C to + 40 °C (higher ambient temperatures (45 °C) on request)
Humidity (non condensing)	< 90 % rel. humidity at + 20 °C < 70 % rel. humidity at + 40 °C
Rain, drop / splash water	The analyzer must not be exposed to rain or drop/splash water
Explosive atmosphere	The analyzer must not be operated in explosive atmosphere without supplementary protective measures
Altitude	0-2000 m (above sea level)

### 27.3 Signal Inputs / Outputs, Interfaces

<p>2 analog outputs per channel [(optically isolated: 2 channels, common ground), offset (begin of range) and end of range are free programmable] Option:</p>	<p>0 - 10 V and 0 - 20 mA (<math>R_B \leq 500 \text{ W}</math>) or 2 - 10 V and 4 - 20 mA (<math>R_B \leq 500 \text{ W}</math>), adjustable via keyboard 0 (0.2) - 1 V and 0 (4) - 20 mA (<math>R_B \leq 500 \text{ W}</math>)</p>
<p>3 analog inputs (Option for TC), for electronic cross compensation of up to 3 interfering components (external signals)</p>	<p>0 - 10 V, 0 - 20 mA, 2 - 10 V, 4 - 20 mA, 0 - 1 V or 0.2 - 1 V</p>
<p>8 digital outputs, parallel (optically isolated)</p>	<p>2 threshold contacts per channel, Sample gas valve, Zero gas valve, Span gas valve 1, Span gas valve 2 (dual channel only)</p> <p>“Open Collector”, max. 30 V DC / 30 mA</p>
<p>7 digital inputs, parallel (Option)</p>	<p>Zero gas calibration ch.1 &amp; ch.2, Span gas calibration ch.1, Span gas calibration ch.2, open Zero gas valve, open Span gas valve 1, open Span gas valve 2 (dual channel only) close Sample gas valve/ sample gas pump Off Description: see chapter 13 and 29.8!</p>
<p>serial interface (Option, optically isolated) (not in combination with field bus)</p>	<p>RS 232 C or RS 485 (2 or 4 wire support)</p>
<p>FOUNDATION™ fieldbus (Option)</p>	<p>(not in combination with serial interface)</p>
<p>3 output relays (Option status signals)</p>	<p>“Measure/Calibration” / “Failure Analyzer” / “Sample Gas Pump On/Off” “non-voltage carrying contacts” max. 30 V / 1 A / 30 W</p>

Diagram/dimensions without 24 VDC elbow socket (+ approx. 30 mm)

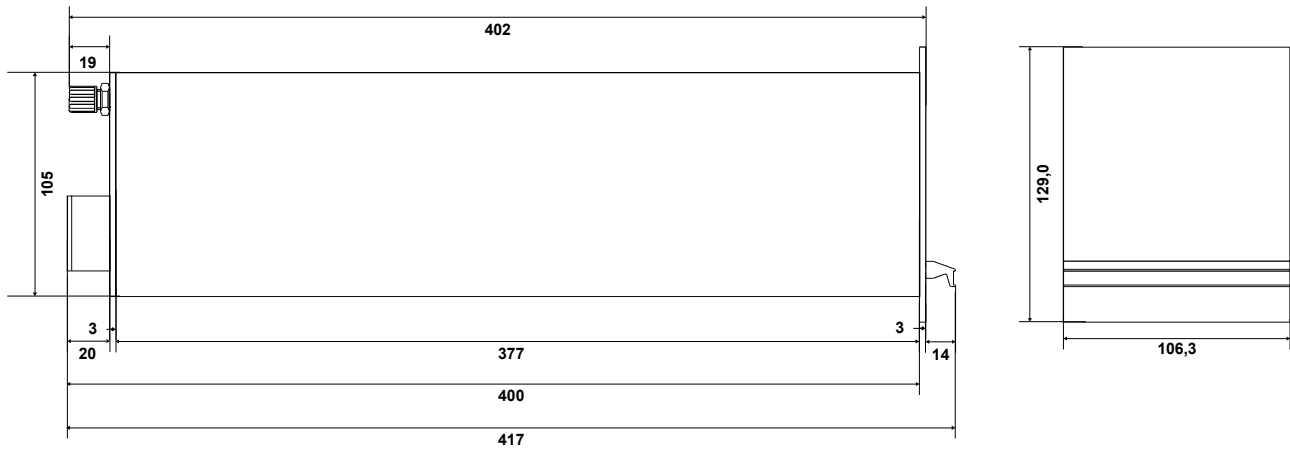


Fig. 27-1: Dimensional sketch BINOS® 100 (M) / OXYNOS® 100 / HYDROS® 100 (dimensions in [mm])

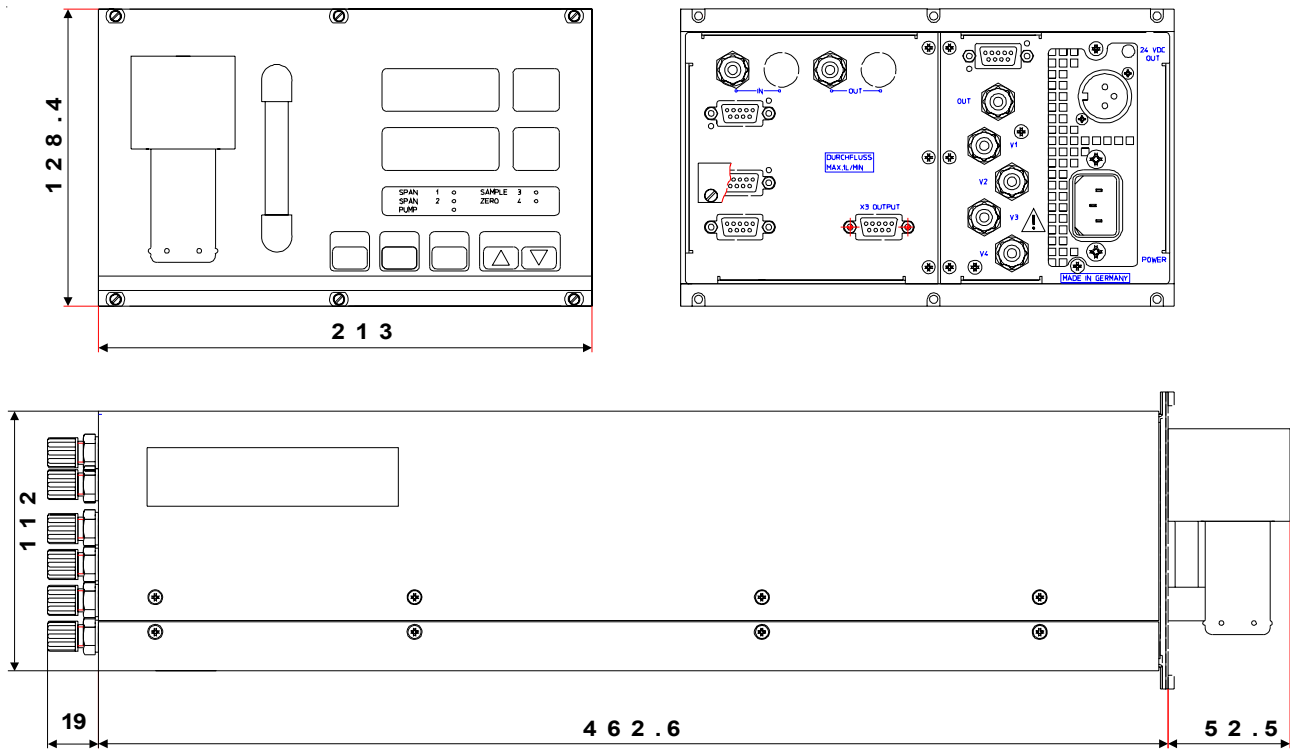
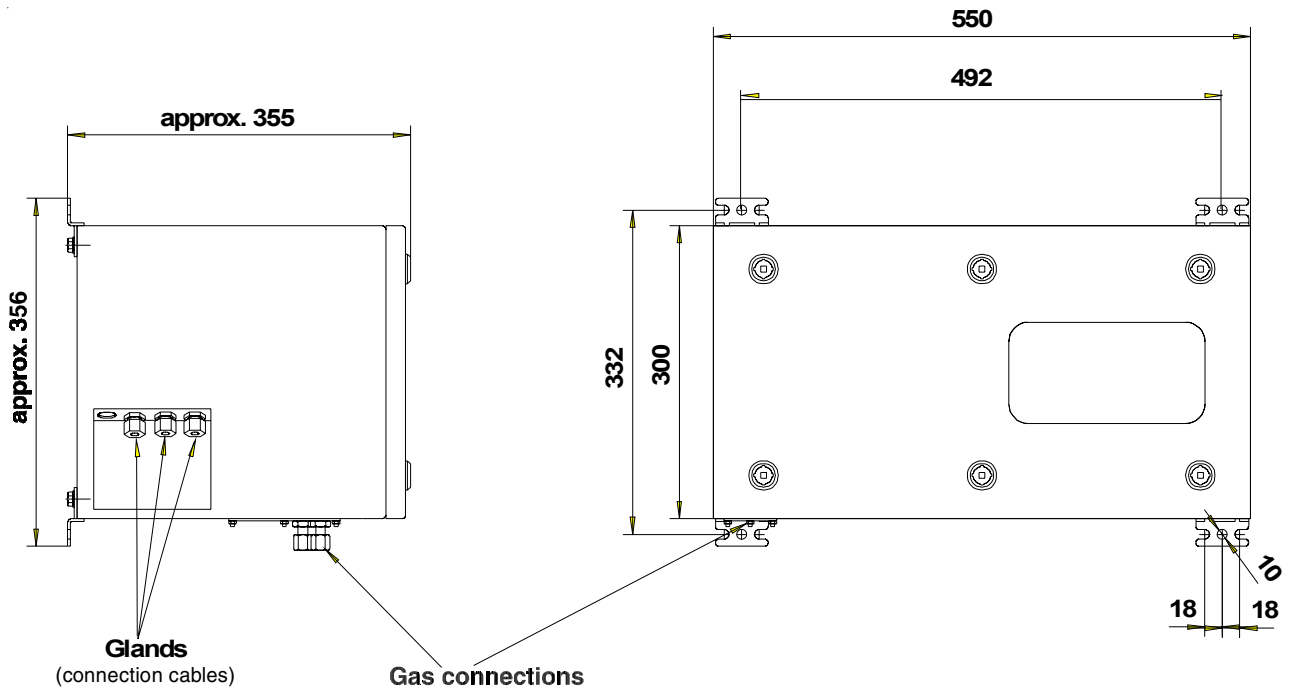
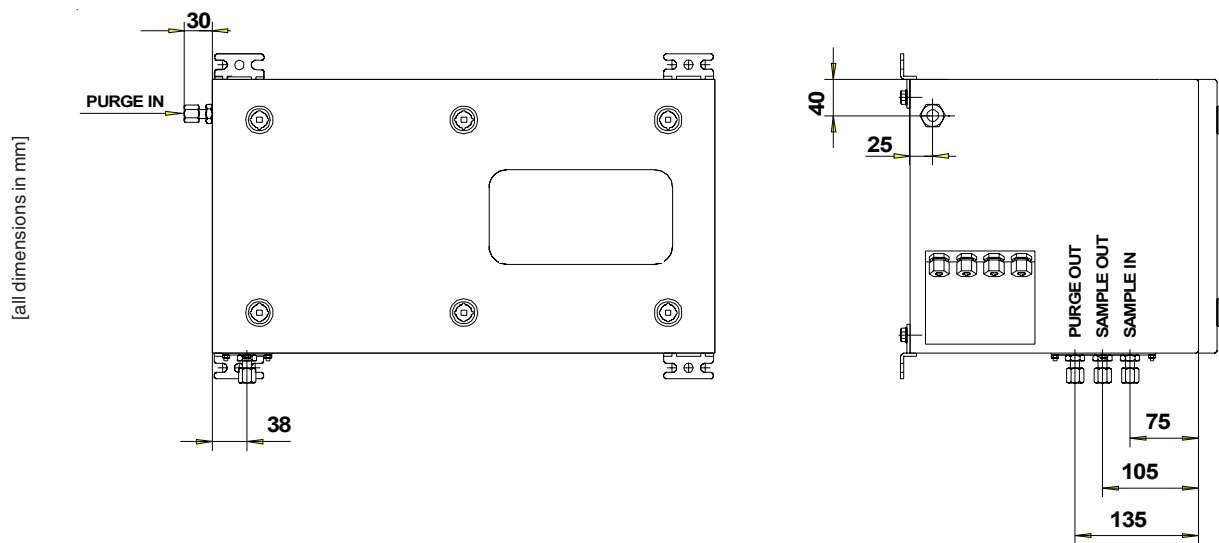


Fig. 27-2: Dimensional sketch BINOS® 100 2M (dimensions in [mm])





**Fig. 27-3: Dimensional sketch/ Drill drawing BINOS® 100 F Single Section Housing for General Purpose Applications (dimensions in mm)**



**Fig. 27-4: Dimensional sketch BINOS® 100 F with Continuous Purge for CENELEC Ex Zone 1 Applications or with Z purge for CSA-C/US Ex Zone 2 Non-Flammable Atmospheres**

## 27.4 Gas Related Specifications

For information about measuring components and ranges of the actual analyzer refer to the nameplate label, which is located on the left or right side of the analyzer cover (all table top and rack mount versions) or inside the front door (BINOS 100 F).

See chapter 27 for information about how to read a name plate label.

### Available Measuring Components and Ranges

(some components / ranges may not be available with all analyzer versions)

Gas Component		Minimum Ranges	Maximum Ranges
Argon	Ar	0 - 50 %	0 - 100 %
Carbon dioxide	CO <sub>2</sub>	0 - 100 ppm	0 - 100 %
Carbon monoxide	CO	0 - 200 ppm	0 - 100 %
Ethylene	C <sub>2</sub> H <sub>4</sub>	0 - 400 ppm	0 - 100 %
Helium	He	0 - 10 %	0 - 100 %
Hexane	C <sub>6</sub> H <sub>14</sub>	0 - 500 ppm	0 - 9,000 ppm
Hydrogen	H <sub>2</sub>	0 - 5 % ( 2 % <sup>*)</sup> )	0 - 100 %
Methane	CH <sub>4</sub>	0 - 2 %	0 - 100 %
n - Butane	C <sub>4</sub> H <sub>10</sub>	0 - 800 ppm	0 - 100 %
Oxygen	O <sub>2</sub>	0 - 1 % <sup>***</sup>	0 - 100 % <sup>****)</sup>
Propylene	C <sub>3</sub> H <sub>6</sub>	0 - 4,000 ppm	0 - 100 %
Propane	C <sub>3</sub> H <sub>8</sub>	0 - 1,000 ppm	0 - 100 %
Toluene	C <sub>7</sub> H <sub>8</sub>	0 - 5,000 ppm	0 - 1,2 %

<sup>\*)</sup> Other components and configurations on request

<sup>\*\*)</sup> Dew point must not exceed ambient temperature

<sup>\*\*\*)</sup> Non-standard specifications

## Measuring System Specifications

(Values refer to the lowest ranges. Standard ranges with better specs.)

	NDIR	Oxygen Sensor (PO <sub>2</sub> and EO <sub>2</sub> )	Thermal Conductivity
<b>Detection limit</b>	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4)</sup>	≤ 2 % <sup>1) 4)</sup>
<b>Linearity</b>	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4)</sup>
<b>Zero-point drift</b>	≤ 2 % per week <sup>1) 4)</sup>	≤ 2 % per week <sup>1) 4)</sup>	≤ 2 % per week <sup>1) 4)</sup>
<b>Span (sensitivity) drift</b>	≤ 1 % per week <sup>1) 4)</sup>	≤ 1 % per week <sup>1) 4)</sup>	≤ 1 % per week <sup>1) 4)</sup>
<b>Repeatability</b>	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4)</sup>
<b>Total response time (t<sub>90</sub>)</b>	< 5 s <sup>3) 5)</sup>	< 5 s <sup>3) 6)</sup> / Approx. 12 s <sup>3) 9)</sup>	3 s ≤ t <sub>90</sub> ≤ 20 s <sup>3) 7)</sup>
<b>Permissible gas flow</b>	0.2 - 1.5 l/min	0.2 - 1.0 l/min <sup>6)</sup> / 0.2 - 1.5 l/min <sup>9)</sup>	0.2 - 1.0 l/min (± 0.1 l/min)
<b>Influence of gas flow</b>	-	≤ 1 % <sup>1) 4)</sup>	≤ 1 % <sup>1) 4) 13)</sup>
<b>Max. pressure</b>	≤ 1,500 hPa abs.	Atm. pres. <sup>6)</sup> / ≤ 1,500 hPa abs. <sup>9)</sup>	≤ 1,500 hPa abs.
<b>Influence of pressure</b> (At constant temperature)	≤ 0.10 % per hPa <sup>2)</sup> (≤ 0.15 % / hPa at CO <sub>2</sub> ) <sup>2)</sup>	≤ 0.10 % per hPa <sup>2)</sup>	≤ 0.10 % per hPa <sup>2)</sup>
- With pressure compensation <sup>8)</sup>	≤ 0.01 % per hPa <sup>2)</sup> (≤ 0.015 % / hPa at CO <sub>2</sub> ) <sup>2)</sup>	≤ 0.01 % per hPa <sup>2)</sup>	≤ 0.01 % per hPa <sup>2)</sup>
<b>Permissible ambient temperature</b>	+ 5 °C to + 40 °C <sup>10)</sup>	+ 5 °C to + 40 °C <sup>10)</sup>	+ 5 °C to + 40 °C <sup>10)</sup>
<b>Influence of temperature</b> (at constant pressure)			
- On zero point	≤ 1 % per 10 K <sup>1)</sup>	≤ 1 % per 10 K <sup>1)</sup>	≤ 1 % per 10 K in 1 h <sup>1)</sup>
- On span (sensitivity)	≤ 5 % (+ 5 to + 40 °C) <sup>1) 11)</sup>	≤ 1 % per 10 K <sup>1)</sup>	≤ 2 % per 10 K in 1 h <sup>1)</sup>
<b>Thermostat control</b>	-	Approx. 55 °C <sup>6) 12)</sup> / None <sup>9)</sup>	Approx. 75 °C <sup>12)</sup>
<b>Heating-up time</b>	Approx. 15 to 50 minutes <sup>5)</sup>	Approx. 50 minutes <sup>6)</sup>	Approx. 15 minutes

- 1) Related to full scale at system parameter  
END = final value set in our factory and OFS = 0
- 2) Related to measuring value
- 3) From gas analyzer inlet at 1.0 l/min gas flow  
(electr. = 2 s)

- 4) Constant pressure and temperature
- 5) Dependent on integrated photometer bench
- 6) Paramagnetic oxygen measurement (PO<sub>2</sub>)  
dependent on measurement range

- 8) Pressure sensor required
- 9) Electrochemical oxygen measurement (EO<sub>2</sub>),  
not for use with sample gas containing FCHC's
- 10) Higher ambient temperatures (45 °C) on request
- 11) Starting from 20 °C (to + 5 °C or to + 40 °C)
- 12) Sensor / cell only

## Cross sensitivities

electrochemical oxygen measurement:

paramagnetic oxygen measurement:

Not for use with sample gases containing  
FCH's, inorganic gases with chlorines  
and fluorines!

Not for Ozone, H<sub>2</sub>S (> 100 ppm), NH<sub>3</sub> (> 20 ppm)

100 % Gas	zero level effect % O <sub>2</sub>
N <sub>2</sub>	0,00
CO <sub>2</sub>	- 0,27
H <sub>2</sub>	+ 0,24
Ar	- 0,22
Ne	+ 0,13
He	+ 0,30
CO	+ 0,01
CH <sub>4</sub>	- 0,20
C <sub>2</sub> H <sub>6</sub>	- 0,46
C <sub>2</sub> H <sub>4</sub>	- 0,26
C <sub>3</sub> H <sub>8</sub>	- 0,86
C <sub>3</sub> H <sub>6</sub>	- 0,55
NO	+ 43,0
NO <sub>2</sub>	+ 28,0
N <sub>2</sub> O	- 0,20

**27.5 Voltage Supply**

**BINOS® 100 (M) / OXYNOS® 100 / HYDROS® 100 / BINOS® 100 2M** (external power supply)

Input	3-pole XLR- Flange (male), lockable	
Voltage Supply	24 V DC (+/- 5 %)	
[DC voltage supplied by optional power supplies SL5, SL10 (both for rack mounting only) or UPS 01 T or equivalent power supply]		
Power Consumption (analyzer itself)	BINOS® 100 (M)	< 20 W
	OXYNOS® 100	< 40 W
	HYDROS® 100	< 35 W
	BINOS® 100 2M	< 120 W

**BINOS® 100 2M** (internal power supply)

Input	plug
integrated power supply	UPS (input voltage see chapter 27.5.2)
Power Consumption	max. 240 VA
Output to external consumers	3-poliger XLR- Flange (female)
Available power supply to external consumers	max. 2.0 A (depends on internal configuration)

**BINOS® 100 F**

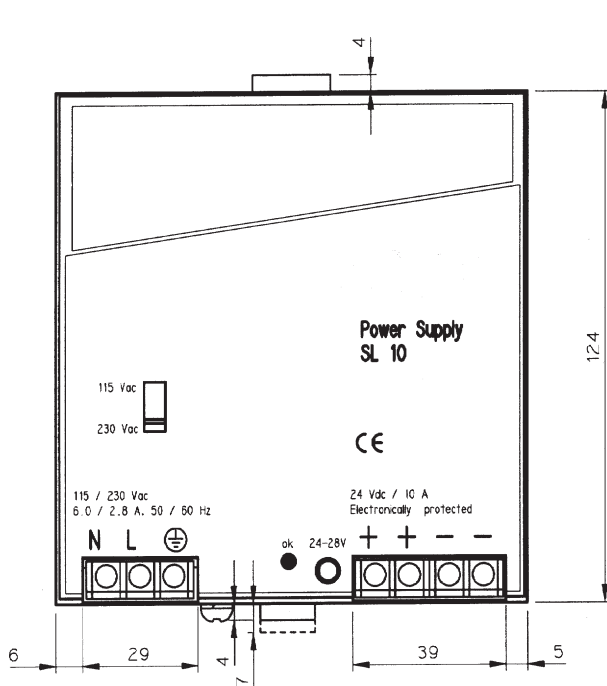
Input	terminal strips
Internal power supply	SL5 (input voltage see chapter 27.5.2)
Power consumption	max. 350 VA
Fuses (internal)	T 3.15 A / 250 V (2 pieces)

**27.5.1 Electrical Safety**

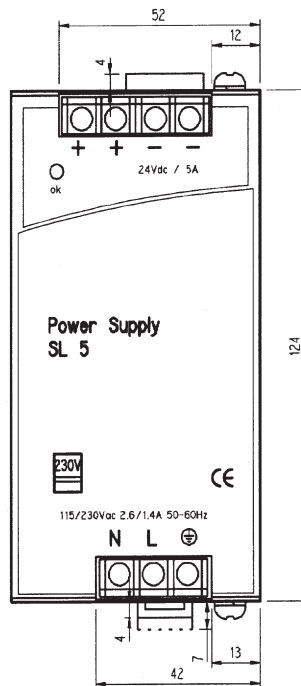
Over-voltage category	I
Pollution degree	2
Safety Class	2 for BINOS® 100 (M)/ OXYNOS® 100 / HYDROS® 100/BINOS® 100 2M (ext. PS) instruments. 1 for BINOS® 100 2M (int. PS)/BINOS® 100 F instruments
all I/O's	SELV voltage optically isolated to electrical supply

**27.5.2 Power Supplies** [UPS 01 T (Universal Power Supply) / SL5 / SL10]

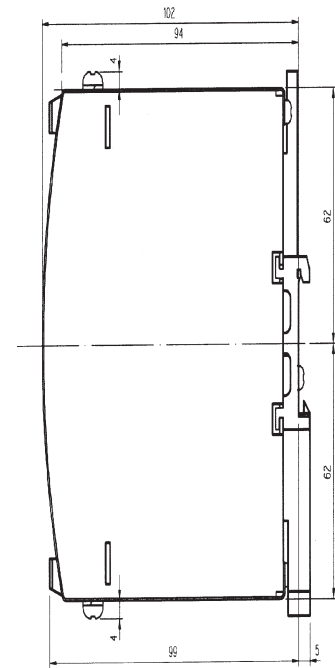
Input (UPS/SL5/SL10)	plug / terminal s / <i>terminal s</i>
Nominal voltage	230 / 120 V AC, 50 / 60 Hz
Input voltage	196–264 V AC and 93–132 V AC, 47-63 Hz
UPS / SL5 or SL10	with autoranging / manual switch
Input power	
UPS or SL5 / SL10	max. 350 VA / max. 700 VA
Fuses UPS (internal)	T 3.15A/250V (2 pcs.)
Output	3-pole XLR- Flange (female) (UPS) / terminals (SL10 / SL5)
Output voltage	24 V DC
UPS / SL5 / SL10	max. 5.0 A / max. 5.0 A / <i>max. 10.0 A</i>
Output power	
UPS / SL5 / SL10	max. 120 W / max. 120 W / <i>max. 240 W</i>
Dimensions	
UPS Rack module	19" 3 HU, 21 DU
Installation depth (with plug / cable)	min. 400 mm
UPS table-top module	see Fig. 27-10
SL5 (mountable on DIN supporting rails TS35)	125 x 65 x 103 mm (HxWxD), see Fig. 27-8 and 27-9
SL10 (mountable on DIN supporting rails TS35)	125 x 122 x 103 mm (HxWxD), see Fig. 27-7 and 27-9



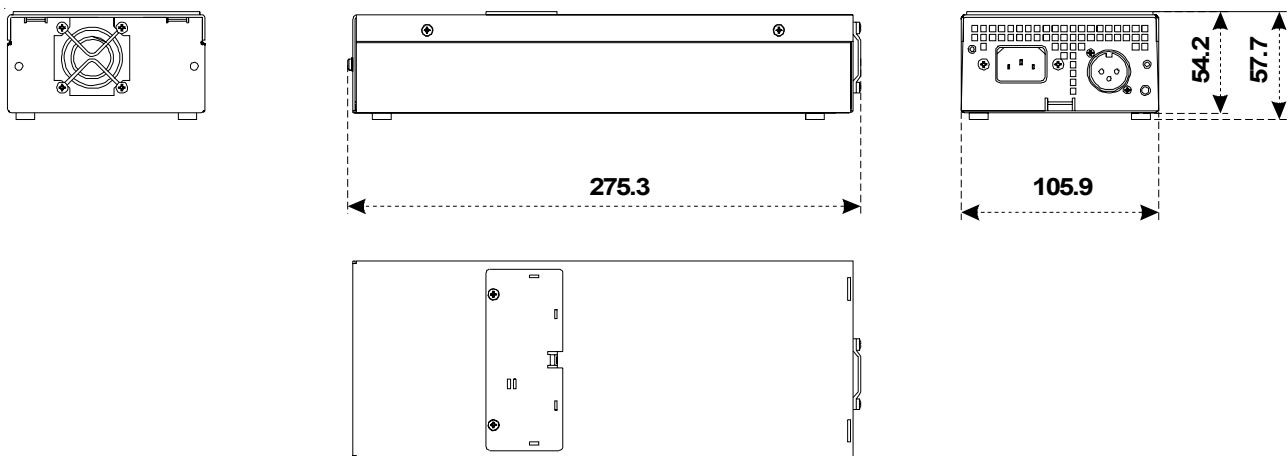
**Fig. 27-7:**  
**Dimensional sketch SL10 (Front view) [mm]**



**Fig. 27-8:**  
**Front view SL 5**



**Fig. 27-9:**  
**Side view SL10/SL5**



**Fig. 27-10: Dimensional sketch UPS 01 T (Universal Power Supply), table-top version rack module turn around 90° [all dimensions in mm, without cable and plugs]**

## 28. Replacing the EPROM

The EPROM may be easily replaced by a new unit when faulty or update the software.

The EPROM - replacement procedure is as follows:

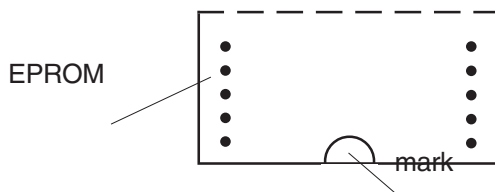
○ Disconnect the analyzer from the source of electric power.



- Open the housing (see chapter 23.).
- Remove jumper J7 (for the battery buffering; see the chapter 19.).
- Pull out the EPROM (chapter 18.).



Align the EPROM with respect to the socket before re-insertion.



The EPROM is aligned correctly if the mark points to the front panel.

○ Insert the EPROM.



- Reconnect jumper J7 (see the chapter 19.).
- Reconnect the instrument to the source of electric power and switch it on [see chapter 6. (the displays must show a flashing "batt.")].

All stored data have now been replaced by default values.

All user and application data, such as system parameters, threshold values etc., must be re-entered.



A complete re-calibration of the instrument (see chapter 9.) must be performed after an EPROM replacement.





## 30. Cables and Cords



To stay in conformance with EMC requirements use our shielded data cables (optionally available) or equivalent data cables only!

The operator has to ensure that the cable shield is connected in correct manner (chapter 29.10):

Shield and connector's housing have to be electrically linked and the housing screwed to the analyzer.



Analyzers with external terminal adaptors (option) do not meet the EMC requirements if the adaptors are not installed in a shielding enclosure.

In this case the customer acts like a "manufacturer of system" and has to confirm conformance.



The standard terminal adaptors inside BINOS® 100 F and optional terminal adaptors for other BINOS 100 series analyzers connect the submin D connector pins to terminals of the same denominator (submin D pin 1 is connected to terminal 1, pin 2 to terminal 2, ...), so pin assignments given in this manual do not change when using adaptors.

### 30.1 24 V DC Supply Cable

NGA-ACC-PS5	Power supply cable for connection of 100 series with UPS/BINOS® 100 2M, 1 m, one elbow socket/ one straight plug
NGA-ACC-PS6	Power supply cable for connection of 100 series with UPS/BINOS® 100 2M, 2 m, one elbow socket/ one straight plug
NGA-ACC-PS7	Power supply cable for connection of 100 series with 5 A / 10 A power supply, 2 m, one side elbow socket, other side 3 single conductors

### 30.2 230/120 V AC Input (BINOS® 100 2M, UPS power supply)

03 861 008 Supply voltage cord to connect a BINOS® 100 2M with mains, 1 m  
(for **Germany only** [Schuko plug])



**Other locations:**

Use cords with an IEC60320 female at one end and an appropriate plug at the other end to meet your local requirements!

**Power cords must have a separate grounding conductor!**

In case of doubt contact your local Emerson Process Management sales office to order an appropriate cord!

### 30.3 Power Supply for Wall Mounted Analyzers (BINOS® 100 F)

**Power cords must have a separate grounding conductor!**

**Variation 1**

Use cords with an appropriate plug at the one end to meet your local requirements and single conductors at the other end, to be connected to the terminals inside the analyzer.

In case of doubt contact your local Emerson Process Management sales office to order an appropriate cord!

**Variation 2**

For permanently connected equipment use cords rated to meet your local requirements and single conductors at the other end, to be connected to the terminals inside the analyzer.

In case of doubt contact your local Emerson Process Management sales office to order an appropriate cord!

<sup>1)</sup> BINOS® 100 2M/F from program version 5.0 or higher only

### 30.3 Data / Signal Lines

#### 30.3.1 Sub D Sockets, 9 pin

The following cables are available for analog signal outputs (X2 Output) and RS 232/485 serial interface option (Interface or X4 Output):

ETC-ACC-101	shielded cable, 2 m, both ends sub D plug and one terminal adaptor
ETC-ACC-102	shielded cable, 2 m, both ends sub D plug
ETC-ACC-103	terminal adaptor with sub D socket, 9 pin and screw terminals

#### 30.3.2 Sub D Plugs, 9 pin

The following cables are available for digital signal outputs (“X3 Output”), status signal option (relay outputs, “X1 Output”) and analog signal input option (TCD, “Cross Comp.” or “Analog In”):

ETC-ACC-104	shielded cable, 2 m, both ends sub D socket and one terminal adaptor
ETC-ACC-105	shielded cable, 2 m, both ends sub D socket
ETC-ACC-106	terminal adaptor with sub D plug, 9 pin and screw terminals







Additional tests of electronics (see chapter 17):

- 33. Supply voltage + 6 V incorrect
- 34. Reference voltage positive incorrect
- 35. Reference voltage negative incorrect
- 36. Motor drive incorrect
- 37. Light barrier signal incorrect
- 38. Temperature sensor incorrect
- 39. Supply voltage + 18 V incorrect
- 40. Analog preamplifiering incorrect

41. Are you satisfied with the services offered by Emerson Process Management? Yes  No   
(If no, give us a short comment please)

Comment or additional failure description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

If factory repair of defective equipment is required, proceed as follows:

1. Secure a return authorization from a Emerson Process Management Sales Office or Representative before returning the equipment. Equipment must be returned with complete identification in accordance with Rosemount instructions or it will not be accepted.
2. In no event will Rosemount be responsible for equipment without proper authorization and identification.
3. Carefully pack defective unit in a sturdy box with sufficient shock absorbing material to ensure no additional damage will occur during shipping.
4. In a cover letter, describe completely:
  - a. The symptoms that determined the equipment is faulty.
  - b. The environment in which the equipment was operating (housing, weather, vibration, dust, etc.).
  - c. Site from which equipment was removed.
  - d. Whether warranty service or nonwarranty service is requested.
  - e. Complete shipping instructions for the return of the equipment.
  - f. Enclose the completed check list
5. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in a Rosemount Return Authorization, prepaid, to:

In Europe:

**Emerson Process Management Manufacturing GmbH & Co. OHG**  
**Service Department**  
**Germany**  
**+49 6055 884-470/-472**

In US:

**Rosemount Analytical Inc.**  
**Process Analytic Division**  
**Customer Service Center**  
**1-800-433-6076**

In Asia Pacific:

**Emerson Process Management**  
**Asia Pacific Pte Limited**  
**1 Pandan Crescent**  
**Singapore 128461**  
**+65-6-777-8211**

If warranty service is expected, the defective unit will be carefully inspected and tested at the factory. If failure was due to conditions listed in the standard Rosemount warranty, the defective unit will be repaired or replaced at Rosemount's option, and an operating unit will be returned to the customer in accordance with shipping instructions furnished in the cover letter.

For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

## Customer Service

For order administration, replacement parts, application assistance, on-site or factory repair, service or maintenance contract information, contact:

In Europe:

**Emerson Process Management Manufacturing GmbH & Co. OHG**  
**Service Department**  
**Germany**  
**+49 6055 884-470/-472**

In US:

**Rosemount Analytical Inc.**  
**Process Analytic Division**  
**Customer Service Center**  
**1-800-433-6076**

In Asia Pacific:

**Emerson Process Management**  
**Asia Pacific Pte Limited**  
**1 Pandan Crescent**  
**Singapore 128461**  
**+65-6-777-8211**

## Training

A comprehensive Factory Training Program of operator and service classes is available. For a copy of the training schedule contact:

In Europe:

**Emerson Process Management Manufacturing GmbH & Co. OHG**  
**Service Department**  
**Germany**  
**+49 6055 884-470/-472**

In US:

**Rosemount Analytical Inc.**  
**Process Analytic Division**  
**Customer Service Center**  
**1-800-433-6076**

In Asia Pacific:

**Emerson Process Management**  
**Asia Pacific Pte Limited**  
**1 Pandan Crescent**  
**Singapore 128461**  
**+65-6-777-8211**



# Series 100 Gas Analyzers

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F +44-1243-845354  
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#### Process Analytic Division

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