Operation Manual

OXYNOS® 100

Microprocessor - Controlled
Oxygen - Analyzer

2. Edition 11/97

Catalog - No: 90 002 955

Process Analytic Division

ROSEMOUNT ANALYTICAL

FISHER-ROSEMOUNT Managing The Process Better

Fisher-Rosemount GmbH & Co assumes no liability for any omissions or errors in this manual.
Any liability for direct or indirect damages, which might occur in connection with the delivery or the use of this manual, is expressly excluded to the extend permitted by applicable law.

This instrument has left the works in good order according to safety regulations.
To maintain this operating condition, the user must strictly follow the instructions and consider the warnings in this manual or provided on the instrument.

Troubleshooting, component replacement and internal adjustments must be made by qualified service personnel only.

The suitability test of OXYNOS® 100 (paramagnetic measurement) at "TÜV Bayern" is reported in GMBl 32/1992, RdSchr. d. BMU from July 1,1992. The OXYNOS® 100 was tested at a waste incinerator plant. So the analyzer is suitable for measuring the concentrations of oxygen according to TI Air, 13th BlmSchV (large furnaces order) and 17th BlmSchV (incineration).
According to the report No. "95CU054/B" about the approval of "TÜV Nord mbH", the gas analyzer OXYNOS® 100 is suitable for measuring the concentrations of oxygen according to TI Air, 13th BlmSchV (large furnaces order) and 17th BlmSchV (incineration).

According to the report No. "IBS/PFG-No. 41300292" about the approval of "DMT - Gesellschaft für Forschung und Prüfung mbh, Fachstelle für Sicherheit - Prüfstelle für Grubenbewetterung", the stationary gas analyzer OXYNOS® 100 is suitable for (paramagnetic) measuring the concentrations of oxygen between 0 and 10 % O_2. The system control with serial interfaces as described in this operation manual have not been subject to the DMT - approval.

1. *Edition: 07/96*
2. Edition: 11/97

Read this operation manual carefully before attempting to operate the analyzer !
For expedient handling of reports of defects, please include the model and serial number which can be read on the instrument identity plate.
Look for the error check list please too (see Item 29. of this manual)

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Safety Summary

In this manual we have used the following safety symbols

to draw your attention to strictly follow these instructions !

1. General

- The following general safety precautions must be observed during all phases of operation, service and repair of this instrument !
  Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of this instrument !
  Failure to comply with these precautions may lead to personal injury and damage to this instrument !

- Fisher-Rosemount GmbH & Co. assume no 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 Fisher-Rosemount Sales and Service office for service or repair to ensure that safety features are maintained !

- Operating personnel must not remove instrument covers !
  Component replacement and internal adjustments must be made by qualified service personnel only !

- Instruments which appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Read this operation manual carefully before attempting to operate with the instrument !

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

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).

Due to the high temperatures of photometer or heated components there is a danger of burns to the operators.

2. Gases and Gas Conditionning (Sample Handling)

Do not interchange gas inlets and gas outlets !
All gases have to be supplied to the system as conditionned gases !
When the instrument is used with corrosive gases, it is to be verified that there are no gas components which may damage the gas path components.

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

Be sure to observe the safety regulations for the respective 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 a danger to the operators by explosive, toxic or unhealthy gas components, first purge the gas lines with ambient air or nitrogen (N_2) before cleaning or exchange parts of the gas paths.

3. Supply Voltage 

- Verify correct polarity for 24 V DC - operation !

- This product is a Safety Class 1 instrument (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 !

- Use only power supply VSE 2000 or equivalent power supplys to be in agreement with the CE - conformity.

- In case of exchanging 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).

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

4. Connection Cables

- Use only from our factory optional delivered cables or equivalent shielded cables to be in agreement with the CE - conformity.
  The customer has to guarantee, that the shield is be connected bothsided.

- By using of optional delivering terminal strip adapters the analyzer is not be in agreement with the CE - conformity. In this case CE - conformity is to be declared by customer as “manufacturer of system”.

5. Electrostatic Discharge

The electronic parts of the analyzer can be irreparably damaged if exposed to **e**lectro**s**tatic **d**ischarge (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 reasonably 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 electrically 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 electrically grounded (any device that has a three - prong plug is electrically grounded 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).

6. Operating Conditions according to DMT - Approval

(Chapter 6 of the supplement I to the DMT - report No. “IBS/PFG-No. 41300292” about the performance test of the stationary gas analyzer OXYNOS® 100.

According to the system version and measuring results included in this report, the stationary gas analyzer OXYNOS® 100 (paramagnetic measurement) from Rosemount GmbH & Co. is suitable for measuring the concentrations of oxygen between 0 and 10 % O_2, 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 (admissible error limit) will not be exceeded, taking into account the systematics failures of the measuring signals (as indicated in this report) and the local operating conditions. Consider the Code of Pratice 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.

- The operatability 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 pathes 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 Pratice No. T023 of the Labor Association of the Chemical Industry "Maintenance of stationary gas warning systems for explosion protection".

- The system control with serial interfaces described in this operation manual have not been subject to this investigation.

- Sample gas condensation in oxygen analyzer (components) must be prevented by taking the necessary steps (oxygen cell is thermostated).

- 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 sanalyzers using software versions "3.03" and "4.00" and "4.01". 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 and 10 % O_2 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°C 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. 41300292"

  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.

Introduction

The OXYNOS® 100 gas analyzer is a member of the 100 series of our gas analyzers program. It is designed for the continuous monitoring of oxygen concentrations.

The compactness of the OXYNOS® 100 permits its use in a wide variety of applications in industry and research. Energy conservation, occupational safety, and quality assurance are the major areas addressed.

Some typical specific applications are:

- ❏ Flue gas analyses for combustion efficiency in firing systems, gas cleaning systems and legislation compliance
- ❏ Analysing landfill gas for ex protection
- ❏ Monitoring metallurgical processes in metals refining and processing
- ❏ Monitoring fermentation and sewages processes in biotechnology
- ❏ Motor vehicle exhaust gas analyses (Internal Combustion Engine Emissions)
- ❏ Air quality monitoring (vehicular tunnel, gas production, personal protection)
- ❏ Food industry
- ❏ Universities and Research Institutes

The analyzers of the OXYNOS® 100 series are complete, ready - to - use, gas analyzers which may be directly inserted into existing or planned gas lines.
Since OXYNOS® 100 is working according to the extractive measuring method an adequate sample handling system has to be provided.

The analyzer is microprocessor controlled.

Programming available with use of optional, external solenoid valves permit fully automatic calibration of the analyzer.

All inputs required may be activated by a host computer via an optional serial interface (RS 232 C / 485), for networking applications.

Note:
Read this operation manual carefully before attempting to operate the analyzer !

For single - channel analyzers:
The display, entries and error messages for the second channel described in this manual are inapplicable.

1. Setup

The analyzer it incorporated in a 1/4 19" rack-mounting housing, 3 height units.

The optional table-top housing is fitted with a carrying strap and rubber feets additional.

1.1 Front Panel

The front panel (see Fig. A-1) includes the LED - displays and all of the analyzer operating controls.

1.2 Rear Panel

The rear panel (Fig. A-2) includes

- ❏ the gas line fittings
- ❏ the plug for the electrical supply input
- ❏ the sub-miniature “D” mating socket for the analog signal outputs
- ❏ the sub-miniature “D” plug for the digital outputs (concentration limits and valve control)
- ❏ **optionally** the sub-miniature “D” mating socket for the RS 232 C / 485 - interface
- ❏ **optionally** the sub-miniature “D” plug for the status signals (relay outputs)

1.3 Inside View

The inside view is shown in Fig. 1-1 a and Fig 1-1 b.

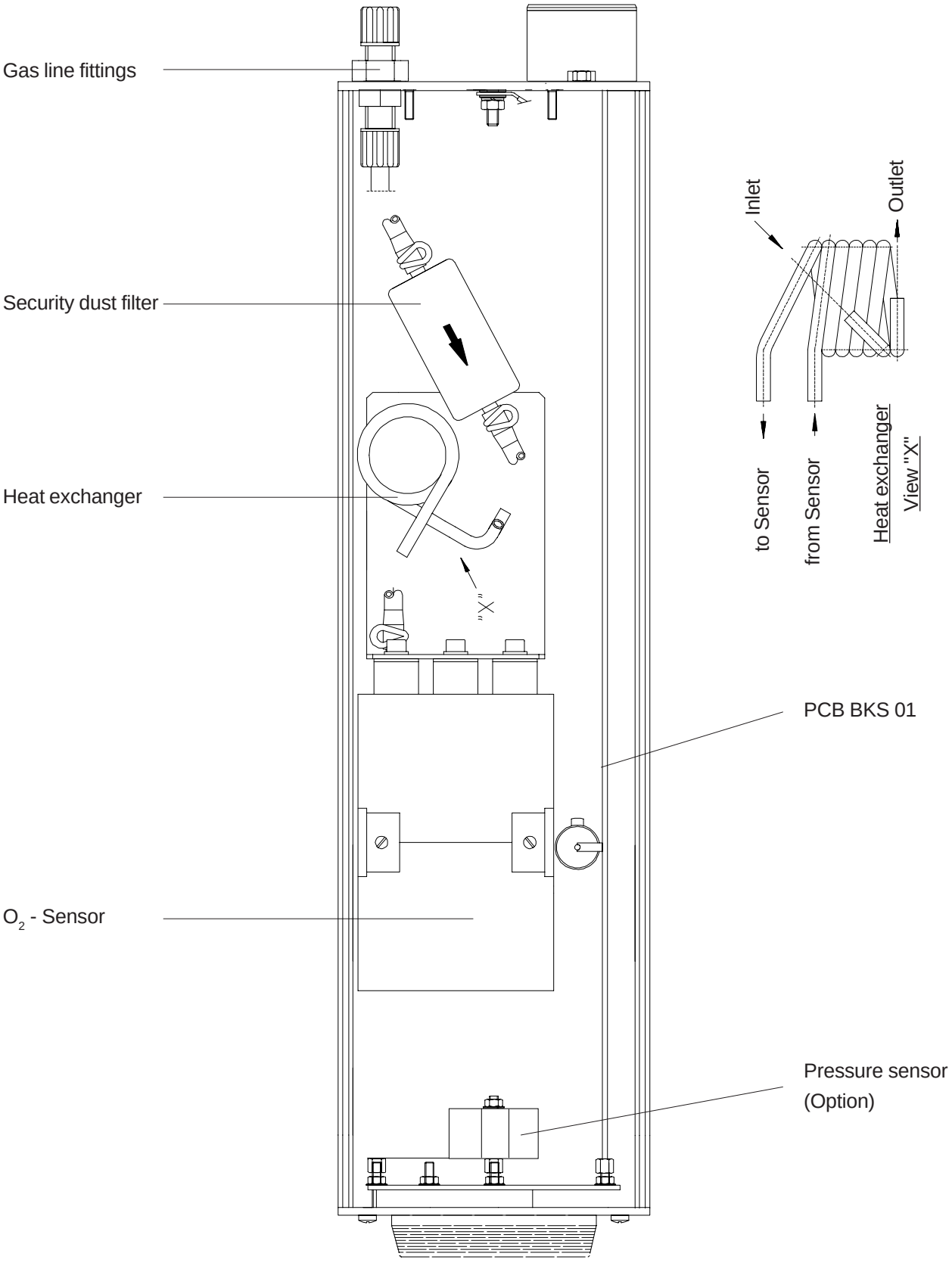


Fig. 1-1a: OXYNOS® 100, Inside View with paramagnetic sensor

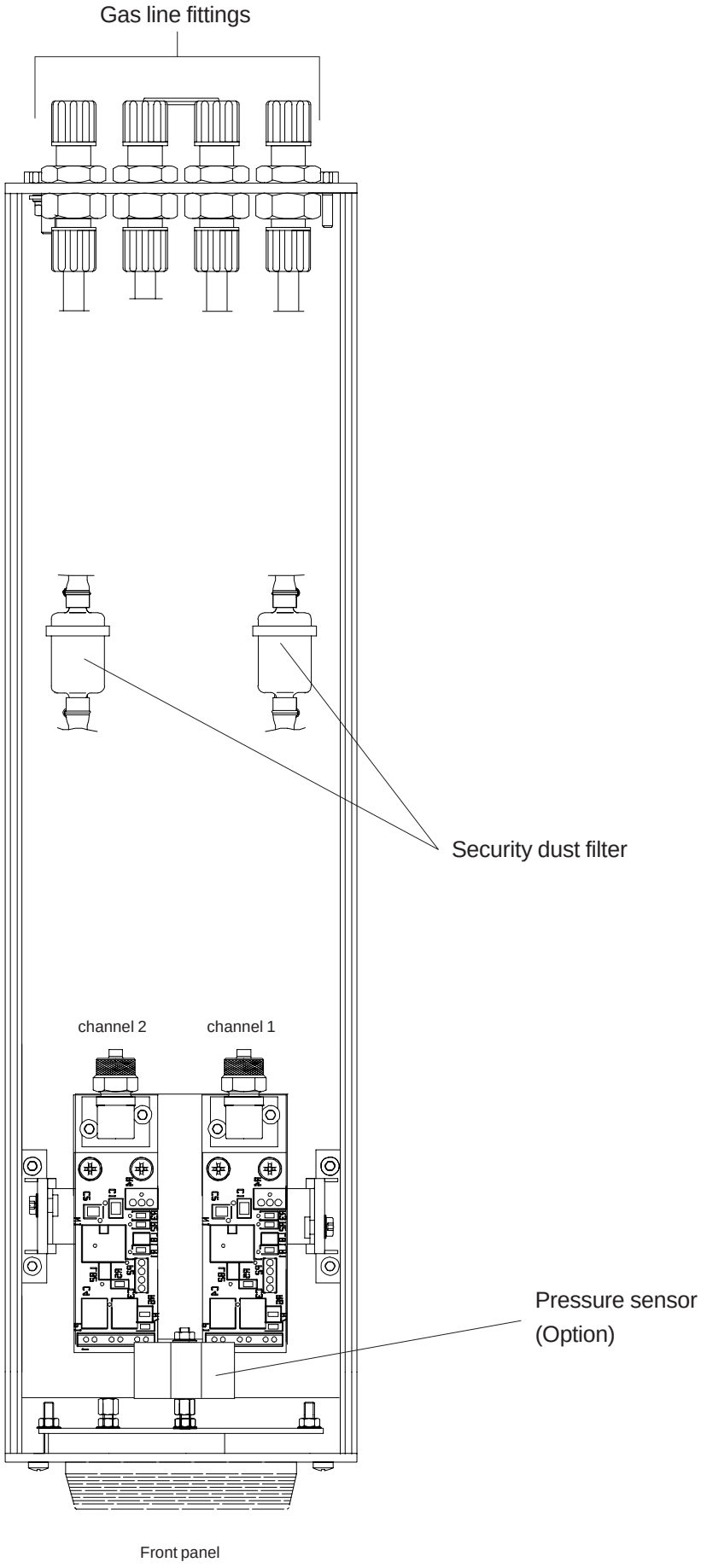


Fig. 1-1b: OXYNOS® 100, Inside view with electrochemical sensor

3. Measuring Principle

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. A.1).

% O_2 para. = paramagnetic Sensor
% O_2 chem. = electrochemical Sensor

3.1 Paramagnetic Measurement

The determination of O_2 - concentration is based on the paramagnetic principle (magneto-mechanic principle).

Two nitrogen-filled (N_2 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_2 - 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 angulary 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_2 - 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 thermostatted up to approx. 55 °C. For warming up the measuring gas is conducted via a heat-exchanger.

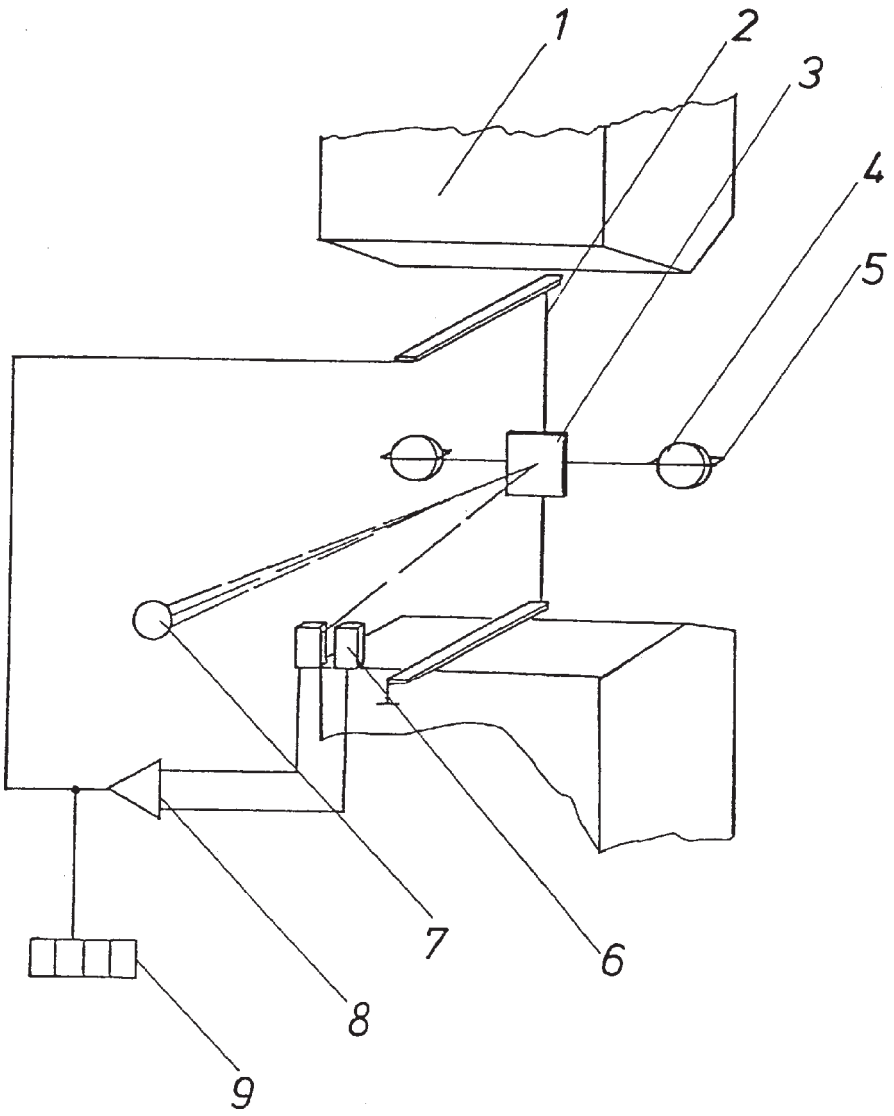


Fig. 3-1: Principle Construction of paramagnetic Analysis Cell

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

3.2 Electrochemical Measurement

The determination of O_2 - concentrations is based on the principle of a galvanic cell.
The principle structure of the oxygen sensor is shown in Fig. 3-2.

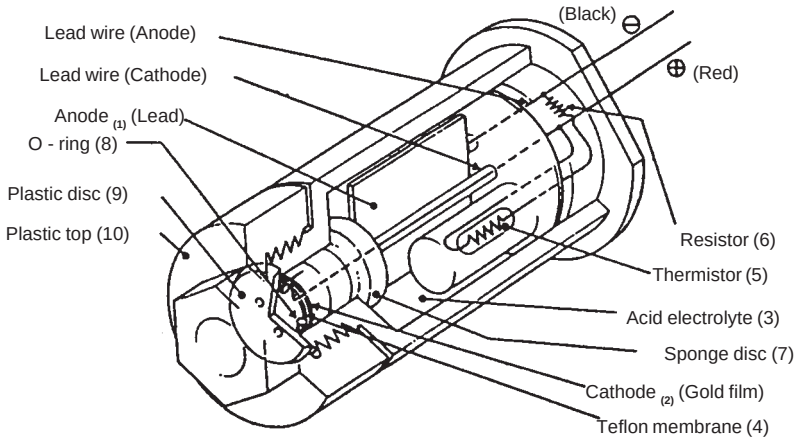


Fig. 3-2: Structure of electrochemical Oxygen Sensor

The oxygen senor incorporate a lead/gold oxygen cell with a lead anode (1) and a gold cathode (2), using a specific acid electrolyte. To avoide 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.

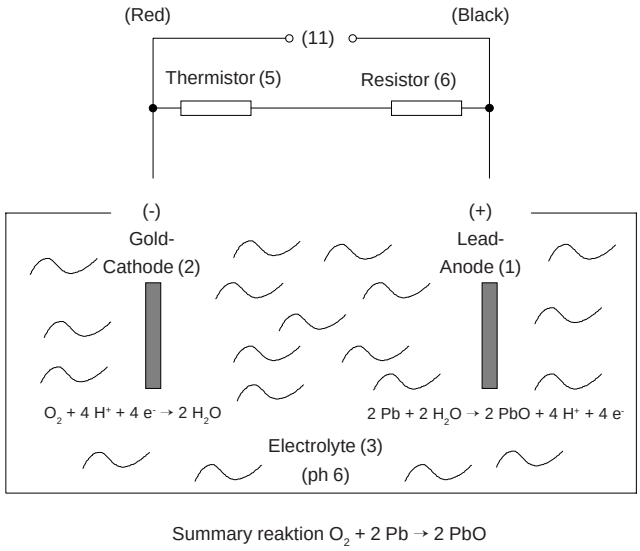


Fig. 3-3: Reaction of galvanic cell

The electric current between the electrodes is proportional to the O_2 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 senor (11) represents the oxygen concentration.

4. Main Features

- 1/4 19" housing, 3 HU
- 2 parallel measuring channels possible for electrochemical sensors
- 4 - digit LED - measuring value display and operators prompting via this displays for each measuring channel
- The response time (t_{90} - time) can be adjusted separately for each measuring channel
- Plausibility checks
- Temperature compensations
- Analog signal outputs [0 (2) - 10 V {Option 0 (0,2) - 1 V} / 0 (4) - 20 mA], optically isolated
- Monitoring of two free adjustable concentration limits for each measuring channel (max. 30 V DC / 30 mA, “Open Collector”, optically isolated)
- Automatic calibration using zeroing and spanning at preselected intervals (external solenoid valves are required for this)
- RS 232 C/485 serial interface for data intercommunications with external computers (optional)
- Status signals as option (Non-voltage-carrying contacts, max. 42 V / 1 A)
- Self - diagnostic procedures, plus maintenance and servicing support functions
- Operator prompting for the avoidance of operator errors

5. Preparation

Please check the packing and its contents immediately upon arrival.
If any damage or missing items are found, then we request that you notify the forwarder to undertake a damage survey and report the loss or damage to us immediately.

5.1 Installation

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

The installation site for the analyzer has to be **dry** and remain **above freezing point** at all times.
The analyzer must be exposed neither to direct sunlight nor to strong sources of heat.
The permissible ambient temperature are between + 5 °C and + 45 °C for paramagnetic measurement and + 5 °C and + 40 °C for electrochemical measurement.

For outdoor installation, we recommend to install the analyzer in a protective cabinet. At least, the analyzer has to be protected against rain (e.g., shelter).

The 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. Eventually, the analyzer has to be operated in the bypass mode or by an overflow valve to prevent too high flow and too high pressure (Fig. 5-1).

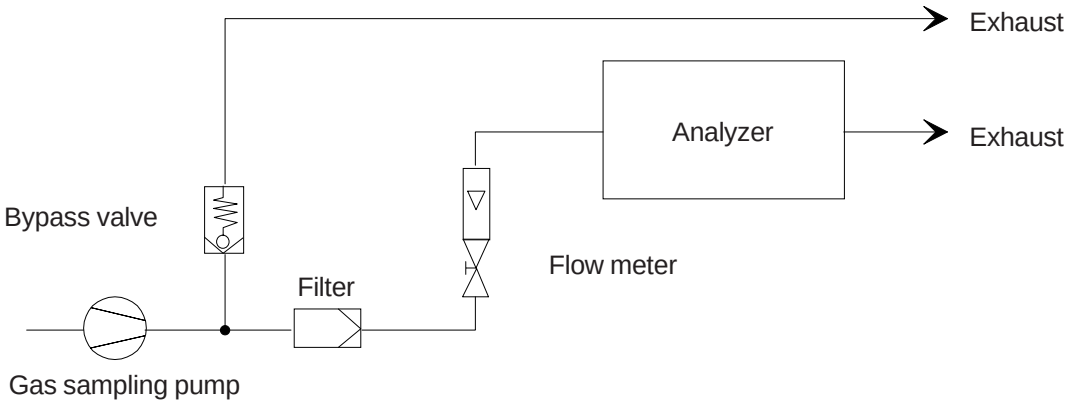


Fig. 5-1: OXYNOS® 100, Bypass installation

5.2 Gas Conditionning (Sample Handling)

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

Only conditionned gas has to be supplied to the analyzer !

The gas has to fullfil the following conditions:

It must be

- ❏ free of condensable constituents
- ❏ free of dust
- ❏ 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 analyzer 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 conditionning hardware may be supplied or recommended for specific analytical problems and operating conditions.

5.2.1 Gas Flow Rate

The gas flow rate should be within the range 0.2 l/min to maxi. 1.5 l/min for electrochemical measurement and 0.2 l/min to maxi. 1.0 l/min for paramagnetic measurement !

The gas flow rate for paramagnetic measurement is allowed to <u>maxi. 1 l/min.</u> !

5.3 Gas Connections

All the fittings for gas line connections are placed just on the rear panel of the analyzer and are clearly marked:

IN = gas inlet (Fig. 5-2 and Fig. A-2, Item 1)
OUT = gas outlet (Fig. 5-2 and Fig. A-2, Item 5)

Do not interchange gas inlets and gas outlets !

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

Zero gas and span gas are introduced directly via the 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 !

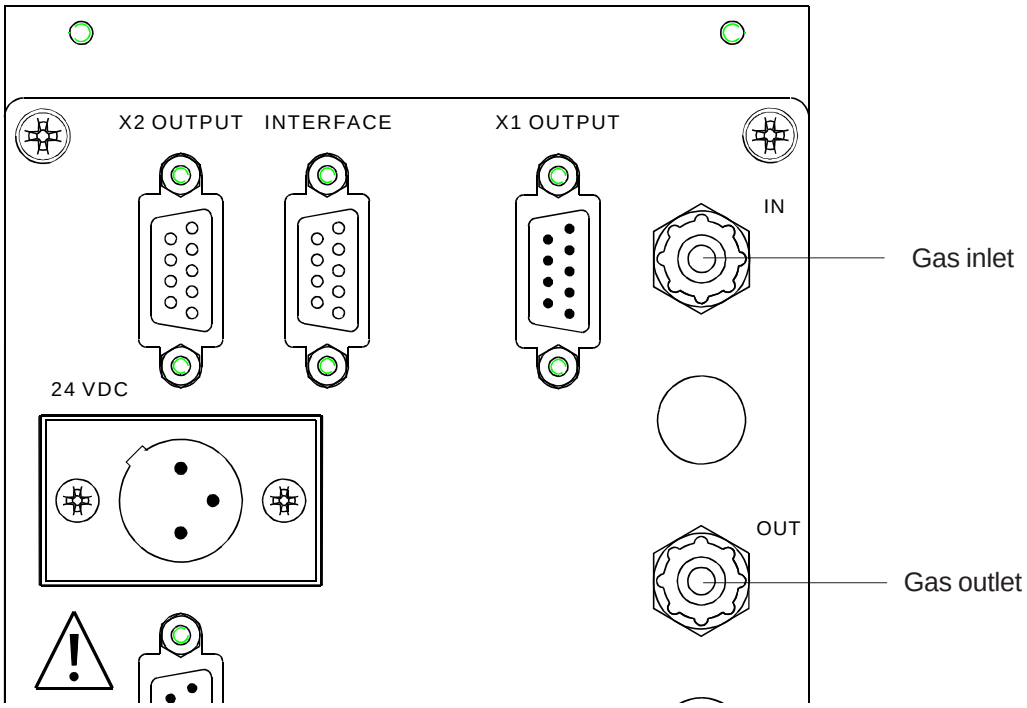


Fig. 5-2a: Gas Connections OXYNOS® 100 (paramagnetic measurement)

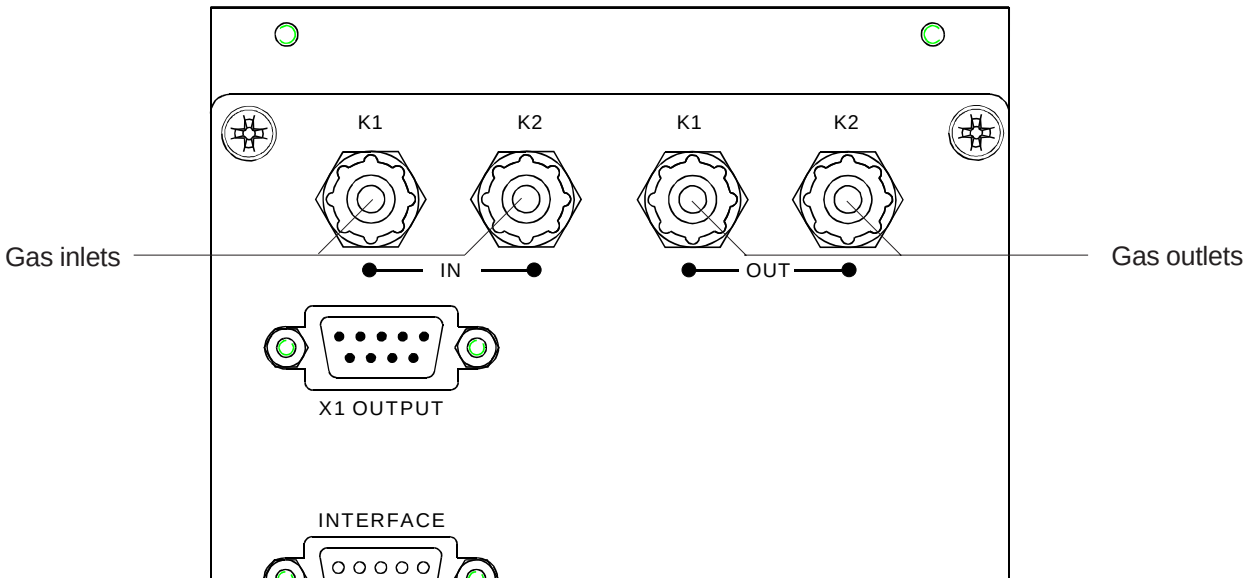


Fig. 5-2b: Gas Connections OXYNOS® 100 (electrochemical measurement)

6. Switching On

Once the analyzer has been correctly assembled and installed in accordance with the general instructions of section “5. Preparation”, the analyzer is ready for operation.

The analyzer is specified for an operating voltage of 24 V DC (+ 20 % / - 50 %).
Operation from 230 / 115 V AC requires the 24 V DC supply via VSE 2000 or equivalent power supply.

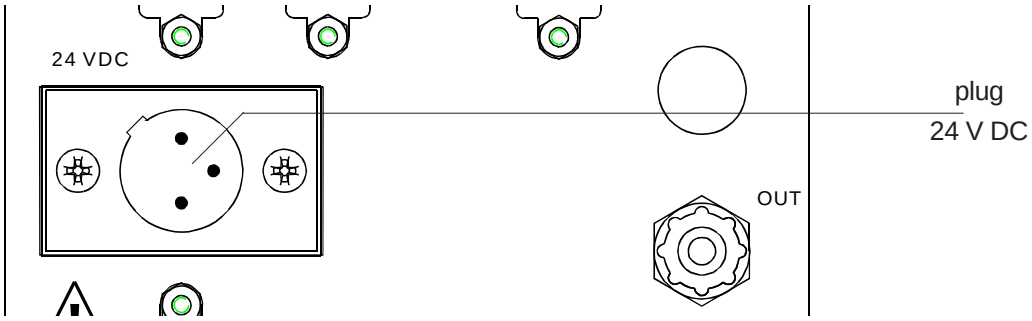


Fig. 6-1a: Supply Voltage OXYNOS® 100 (paramagnetic measurement)

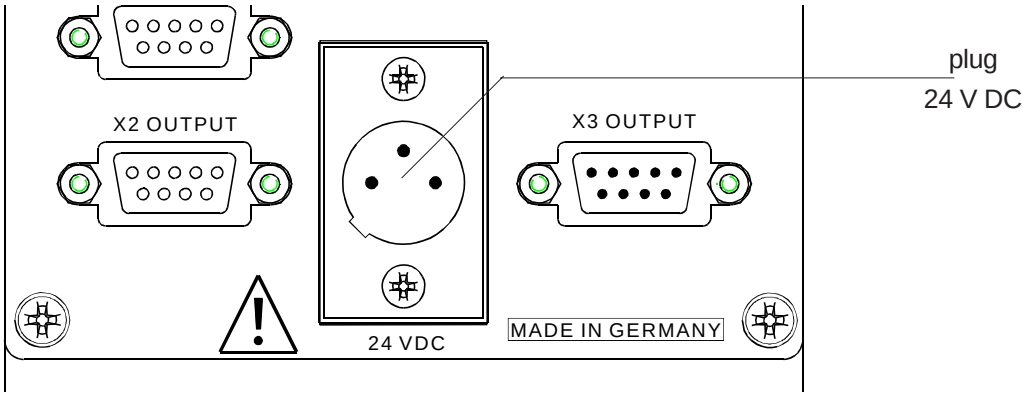


Fig. 6-1b: Supply Voltage OXYNOS® 100 (electrochemical measurement)

6.1 Battery Operation

❍ Connect battery and analyzer (Fig. 6-1, Plug 24 V DC).

Verify beforehand that the battery voltage agrees with the allowed supply voltage of the analyzer ! Verify correct polarity before operation !

6.2 Power Supply Operation

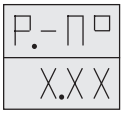
❍ Connect mains line and power supply.

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

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

Verify correct polarity before operation !

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.



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 flushing **"batt**." This message will disappear after depressing any key.

Analyzer warming-up takes about 50 minutes for paramagnetic measurement and about 10 minutes for electrochemical measurement !

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.

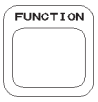
7. Key Functions

The operation and programming of the analyzer is performed using the membrane - type keypad with its four keys (see Fig. A-1, Item 3 - 6).

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

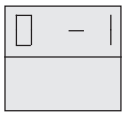
Battery - buffering of the stored parameters prevents their loss in the absense of a power supply failure.

7.1 FUNCTION

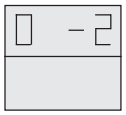


Depressing this key (Fig. A-1, Item 3) addresses the individual analyzer functions in sequence. Merely addressing an analyzer function will not initiate an analyzer action or operation. The analyzer will continue to perform analysis throughout keypad entry procedures.

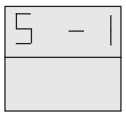
The following analyzer functions and their sequences (see also Fig. 7-1) are shown:



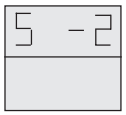
Zeroing channel 1



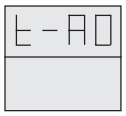
Zeroing channel 2



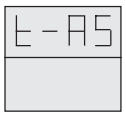
Spanning channel 1



Spanning channel 2

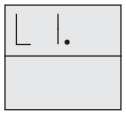


Interval Time for automatic Zeroing

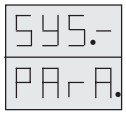


Interval Time for automatic Spanning

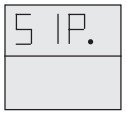
Only in combination of digital outputs and external solenoid valves, and if Auto = 1



Entry of concentration limits



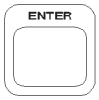
Entry of system parameters.



Entry of serial interface parameters

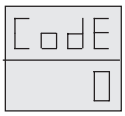
Only with Option RS 232 C/485 Serial Interface

7.2 ENTER



The **ENTER** - key (Fig. A-1, 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.

Depressing within the function sequences (following the sequences from "Zeroing (0 - 1)" to the "interface - parameter (SIP.) using the **FUNCTION** - key) the first time only the **ENTER** - key



will appear on the display.

This indicates that - for safety - a password (user code) must be entered in order to enable the entry level.

If an incorrect password is entered, the CODE display will remain, and the entry displayed will be reset to the value “0”.

When the correct password has been entered, a transfer to the protected entry level will be effected.

This password has been set to the value “1” in our plant before shipment.

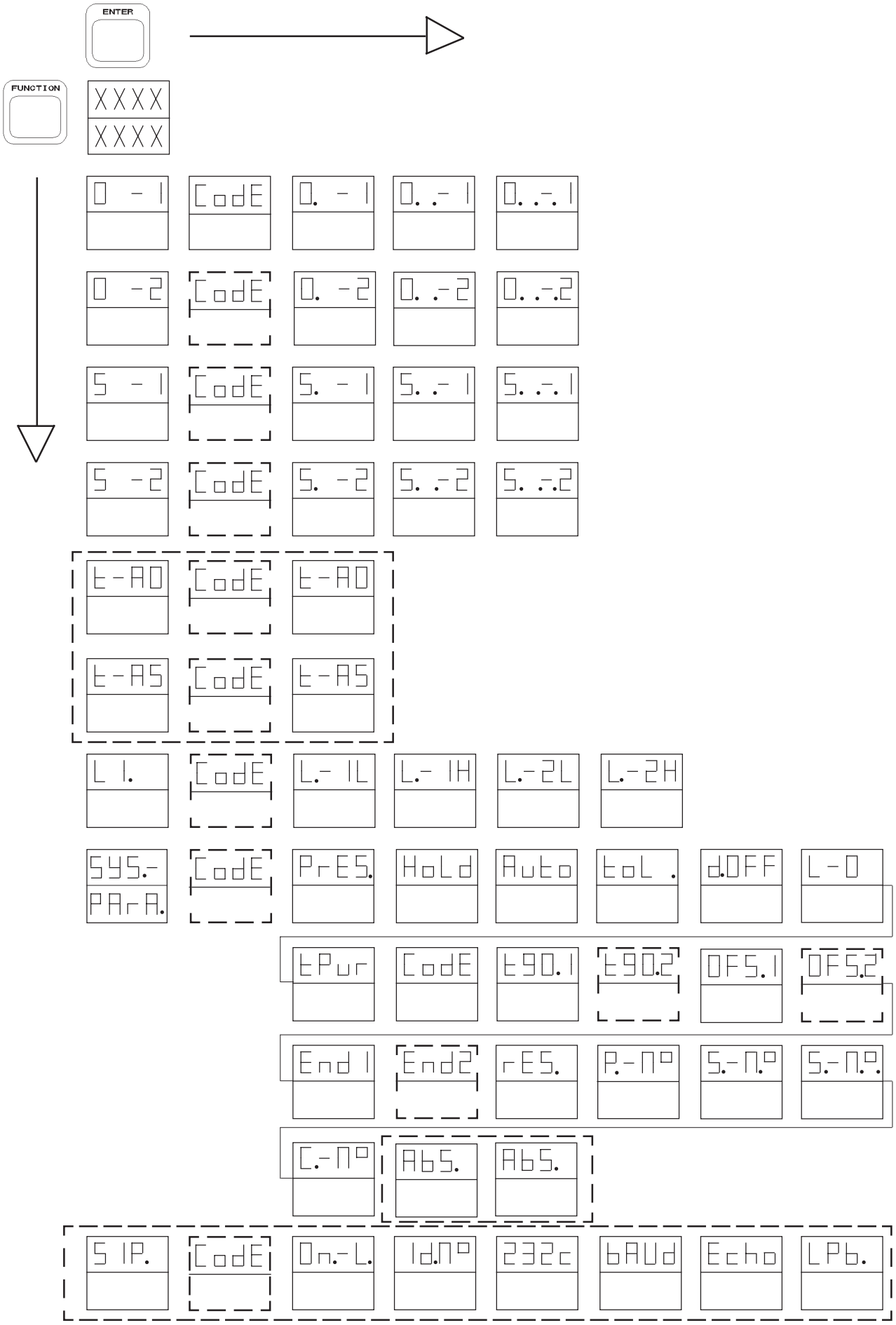
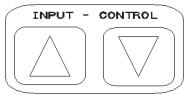


Fig. 7-1: OXYNOS® 100 Operating Function Matrix

7.3 INPUT - CONTROL



This keys (Fig. A-1, Item 5 and 6) are used for the adjustment of the individual entry parameter values. Momentary depressions of either key will alter current values by +/- 1.

UP △ increase current value by 1

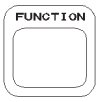
DOWN ▽ decrease current value by 1

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

Each of the entry parameters is assigned an accepted tolerance range which must be observed when entering parameter values. In addition, all entries are subjected to a plausibility check as added protection against operator errors.

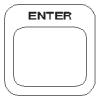
If within about 60 - 120 seconds no further keys have been depressed, the analyzer will automatically revert to the “analysis display”.

8. Entry of System Parameters

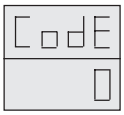
Depress the key 

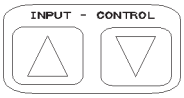
until the text 

appears.

Depress the key 

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

will appear 

Use the keys 

to select the **Code**

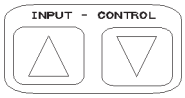
and then using 

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 1300 hPa. The concentration values computed by the analyzer will then be corrected to reflect the barometric pressure or sample gas pressure resp. entry.

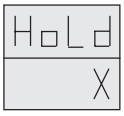
The entry is effected using



and

It is possible to integrate a pressure sensor with a range of 800 - 1100 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.

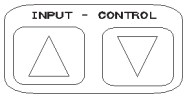
8.2 Hold



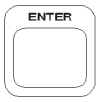
The analyzer function **HOLD** permits keeping the analog signal outputs and the concentration limits locked at the last values measured during a calibration procedure.

Entry of 0: The outputs remain unlocked.
Entry of 1: The outputs will be locked.

Use the keys

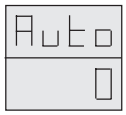


and



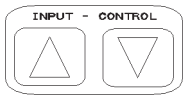
for the entry.

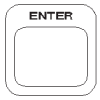
8.3 Automatic Calibration



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

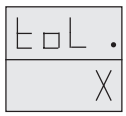
Entry of 0: Time - controlled calibration is not possible
Entry of 1: Time - controlled calibration is possible

Use the keys 

and 

for the entry.

8.4 Tolerance Check

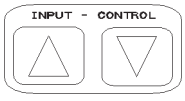


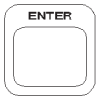
The **tolerance** function is for the activation and deactivation of the tolerance check procedure for various calibration gases.

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).

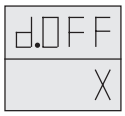
If this **tolerance is exceeded**, **no calibration** will be **performed**, and an error message will appear (see Section 13).

Entry of 0: Tolerance check is deactivated.
Entry of 1: Tolerance check is activated.

Perform the entry using 

and 

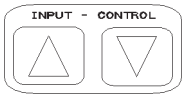
8.5 Display Off



If 1 is entered, the DISPLAY will be deactivated about 1 to 2 minutes after the last key depression. If any key is depressed while the DISPLAY is deactivated, all display elements will be reactivated without any further operation being initiated.

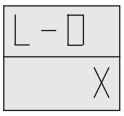
Entry of 0: Display is activated
Entry of 1: Display is deactivated

Entry is performed using



followed by

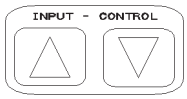
8.6 Analog Signal Outputs



The analog signal outputs (optically isolated) are brought out to the 9 - pin sub - miniature D- connector X2 on the analyzer rear panel.

Entry of 0: Output signal of 0 - 10 V (Option: 0 - 1 V) / 0 - 20 mA.
Entry of 1: Output signal of 2 - 10 V (Option: 0.2 - 1 V) / 4 - 20 mA. (**life zero** mode)

Use the keys



and

for entry.

Note:
The begin of range concentration (OFS.) and the end of range concentration (END) are free programmable (see Item 8.10 and 8.11).
For type of voltage output (standard or option) look at order confirmation or identify plate resp., please.

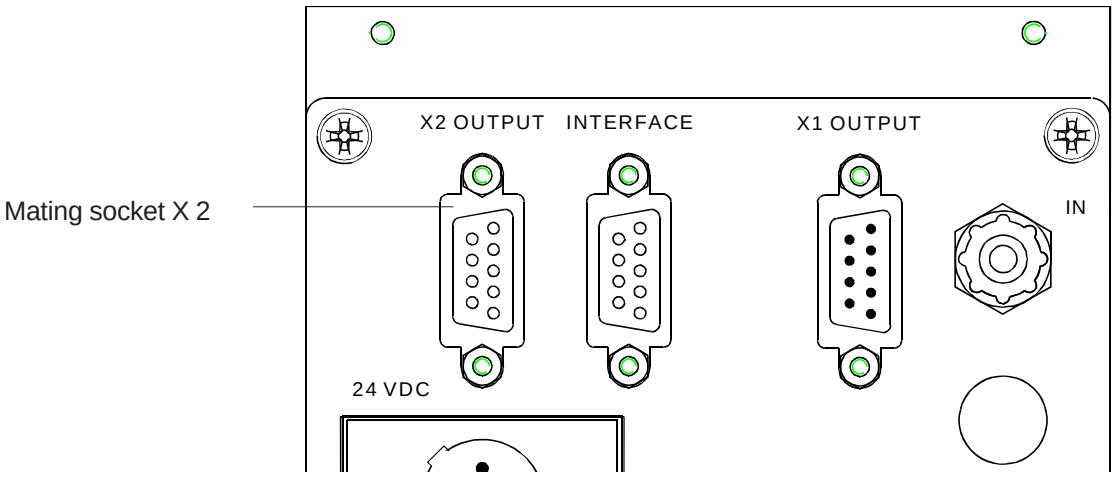


Fig. 8-1a: Mating socket X 2 (analog signal outputs) [OXYNOS® 100 with paramagnetic measurement)

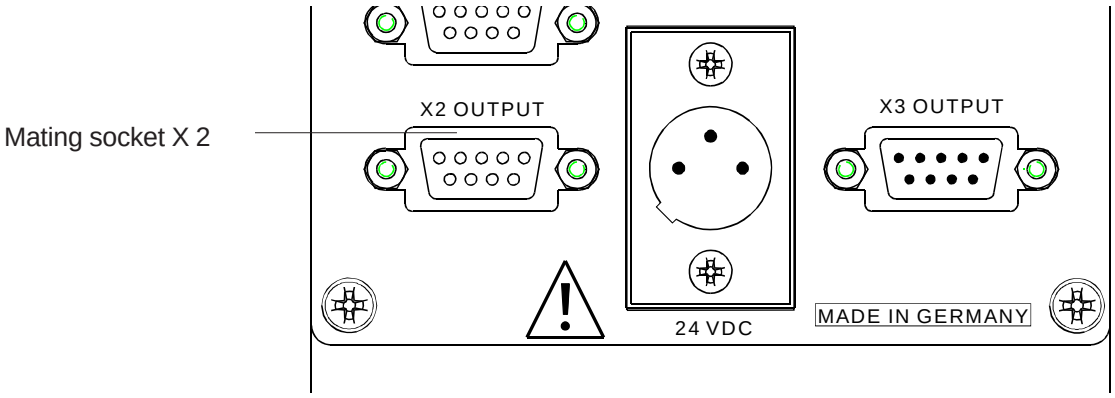


Fig. 8-1b: Mating socket X 2 (analog signal outputs) [OXYNOS® 100 with electrochemical measurement)

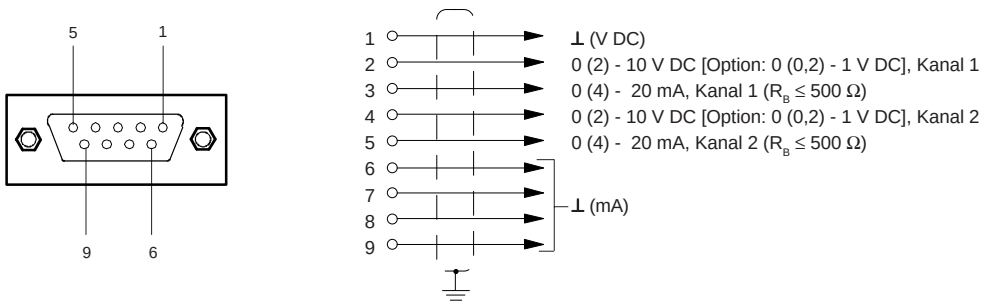
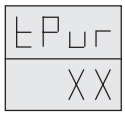


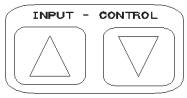
Fig. 8-2: Pin assignments X 2 (analog signal outputs)

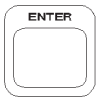
8.7 Flushing Period



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).

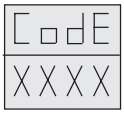
This period may be selected in the range **0 - 99 sec.** depending on calibration conditions.

Use the keys 

and 

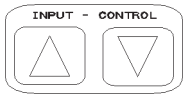
for entry.

8.8 User Code



The value 1 has been set in our plant.

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

Use the keys 

and 

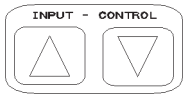
for entry.

Please take care for filing the user code.

8.9 Response Time (t_{90})

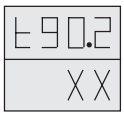
For some types of analysis an alteration of the analyzer damping factor, i.e. its electrical response time, t_{90}, may be required. The operator is offered the option of selecting a response time optimal for each application.

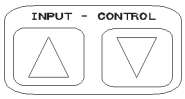
The **range of** accepted **entries** is **2 - 60 sec.**.

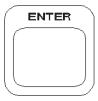
Use the keys 

and 

for the entry.

Entry possibility for channel 2 

Use the keys 

and 

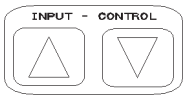
for the entry.

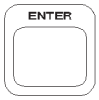
8.10 Offset (Begin of range)

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

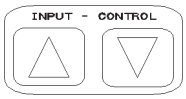
Example:

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.

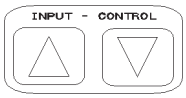
Note:
The **specifications of the analyzer** written in the data sheet are **only for OFS. = 0 and END = full - scale range set in our factory** !
It is part of customer to enter logical values for OFS. and END !

8.11 End of Range Value

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

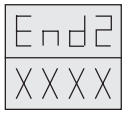
Example:

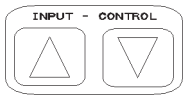
For an analyzer concentration range of 0 - 25 % it is desired to measure only concentrations in the range 0 - 15 %. If the operator enters here the value 15 %, the analog signal outputs of 10 (1) V / 20 mA will then correspond to a gas concentration of 15 %.
The displayed values are not affected.

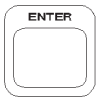
Use the keys 

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 !

8.12 Reset

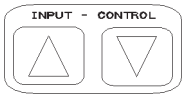
The reset operation restores the settings of the analyzer to the parameters and calibration factors set in our factory at the time of its manufacture.

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

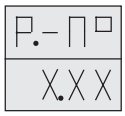


followed by

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 Section 6).

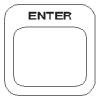
Jumper J6, which activates the watchdog circuitry must be inserted if the reset operation is to be correctly executed.

8.13 Program Version



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

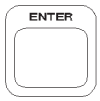
Depress the key



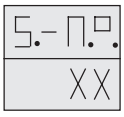
8.14 Serial - No.

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

Depress the key

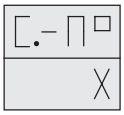


Continuation of Serial - No.



Depress the key

8.15 Copy - No.



The EPROM Copy - No. will be displayed.

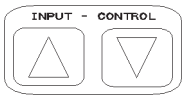
Depress the key

8.16 Absorber

This display will be shown **only with "solenoid valve option"**, if **AUTO = 1**.

For this parameter the entry is set to "0".

Entry is performed using



followed by

Depress the key

until

the displays show

The analyzer now is back in the analysis mode.

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 required test gases have to be fed to the analyzer through the respective test gas inlets (cf. section 5.3) with a no - back - pressure gas flow rate of about 1 l/min (the same as with sample gas) !

After switching on the analyzer, wait at least approx. 50 minutes for paramagnetic measurement or approx. 10 minutes for electrochemical measurement before admit gas to the analyzer !
The gas flow rate for analyzers with paramagnetic oxygen measurement is aloowed to max. 1.0 l/min. !

Note !
For operation with optional, 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” can given optional (see Item 10.3).

Zeroing
For zeroing, the analyzer has to be flushed with nitrogen (N_2) or adequate zerogas.

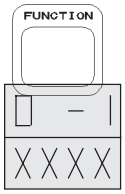
Spanning
The span gas concentration should be in a range of 80 % - 110 % of full - scale range !
For lower span gas concentrations the measuring accuracy could be lower for sample gas concentrations, which are higher than the span gas concentration !
Spanning can be done using ambient air as span gas,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

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 8.1) **!**

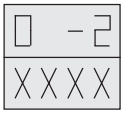
9.1 Manual Calibration

9.1.1 Zeroing 

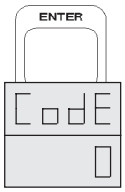
Zeroing will set the actually measured gas concentration to “zero”.

Depress the key 

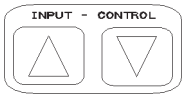
until the display shows (Zeroing channel 1) or



(Zeroing channel 2) resp.

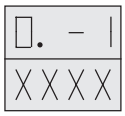
Depress the key 

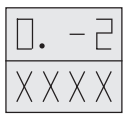
There will appear

Use the keys 

to select the correct **user - code**

and enter using. 

The displays will now show 

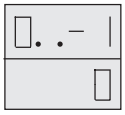
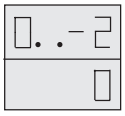
or 

resp.

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

Wait at least the entered flushing - period and t_{90} - time.

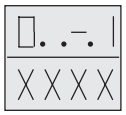
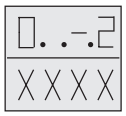
Depress the key 

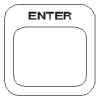
The **nominal value**  or  will be displayed.

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

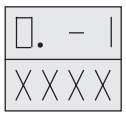
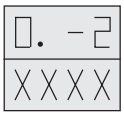
If the two values disagree, then

depress the key 

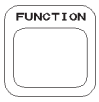
The actual measuring value  or  will be displayed

To start zeroing press  again.

As soon as zeroing has finished, the display indicates

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

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

To leave “calibration mode” press 

9.1.2 Spanning 

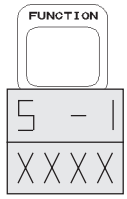
Verification of the span calibration is essential for accurate concentration measurement.

Spanning can be performed only after zeroing before.

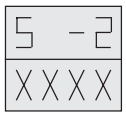
Spanning will set the actually measured gas concentration to the entered “span gas setpoint”.

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 lower for sample gas concentrations, which are higher than the span gas concentration !
Spanning can be done using ambient air as span gas, if the oxygen concentration is known and constant.

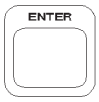
If there is no built-in pressure sensor, the correct pressure must be entered before performing the calibration, if you want to have the possibility of pressure correction (see 8.1) **!**

Depress the key 

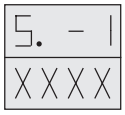
until the display shows (Spanning channel 1) or

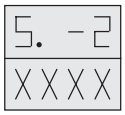


(Spanning channel 2) resp.

Depress the key 

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

The displays will now show 

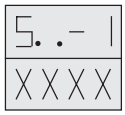
or 

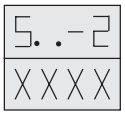
resp.

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

Wait at least the entered flushing - period and t_{90} - time.

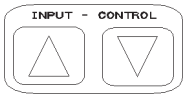
Depress the key 

The **test gas setpoint** 

or 

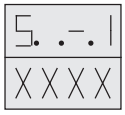
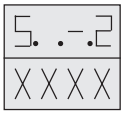
resp. will be displayed.

If necessary, enter the true test gas setpoint value (taken from the manufacturer's certification on the gas bottle)

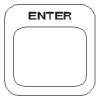
using the key 

and 

using.

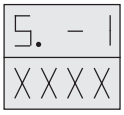
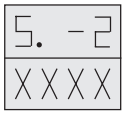
The actual measuring value  or  resp. will be displayed

Leave calibration mode by pressing the **FUNCTION - key** (enter of nominal value without span calibration)

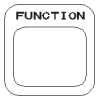
or press 

again to start spanning .

As soon as spanning has finished, the display indicates

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

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

To leave calibration mode press 

9.2 Automatic Calibration Mode (Option)

A time-controlled calibration only can be done with separate external solenoid valves via digital outputs. The automatic function of the analyzer must also be activated correctly (cf. Section 8.3).

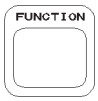
With this function, the analyzer can perform an automatic calibration at preset time intervals. The displays of the analyzer shows additional the functions **t - AO** and **t - AS** using the **FUNCTION** - key.

Note !
For a time-controlled calibration procedure, the test gases **must** be fed through “solenoid valves” controlled by the analyzer in order to ensure the supply of test gases in due course.

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

9.2.1 Zeroing

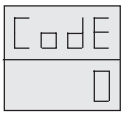
Depress the key

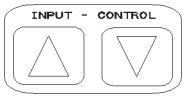


until the displays show

Depress the key

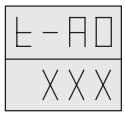
If the correct **user code** has not yet been entered,

the displays shows 

Use the keys 

to select the correct **user - code**

and enter using. 

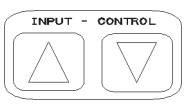
It appears 

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

Point of reference is the real time of entry.

Range of accepted entries: **0 - 399** (hours)

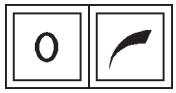
Note !
If the entry is "0" (zero)**, the time - controlled calibration is switched off.**

Entry is performed using 

followed by 

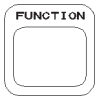
After entry of interval, zeroing will be done automatically at the end of the entered time interval.

9.2.2 Combined Zeroing and Spanning



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

Depress the key



until the message

appears

Depress the key

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

The displays will now show

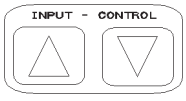
You can enter a time interval (hours), when a automatic zeroing and after that a spanning has to be performed.

Point of reference is the real time of entry.

Range of accepted entries: **0 - 399** (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.

10. Digital Outputs

All analyzer standard digital outputs are brought out to plug X 3 on the rear panel.
The loading of the outputs (“Open Collector”) is max. 30 V DC / 30 mA.

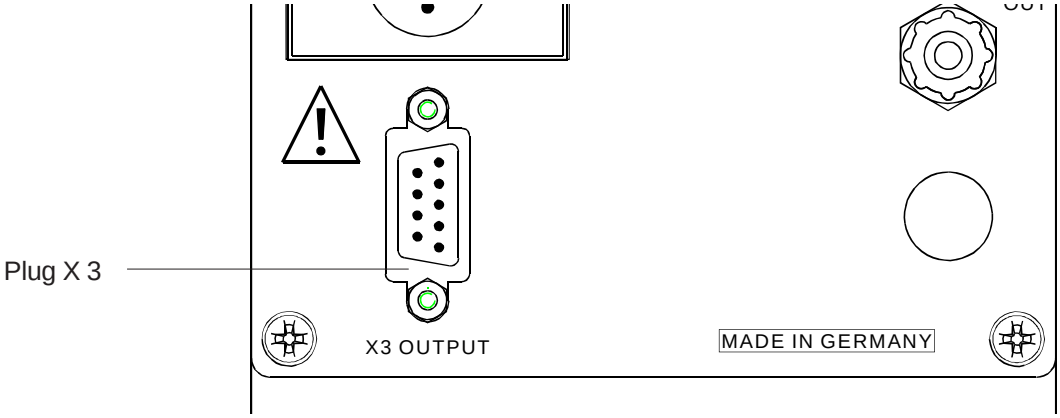


Fig. 10-1a: Plug X 3 (Digital Outputs) [OXYNOS® 100 with paramagnetic measurement]

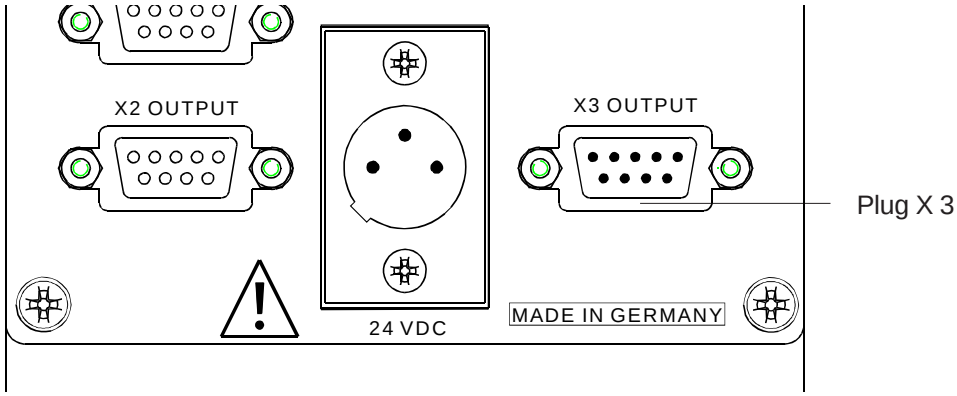


Fig. 10-1b: Plug X 3 (Digital Outputs) [OXYNOS® 100 with electrochemical measurement]

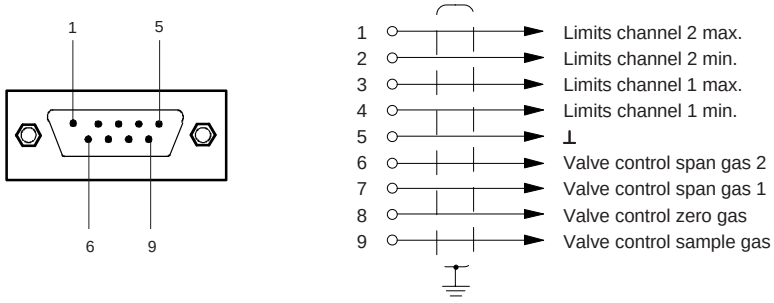
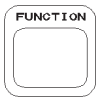


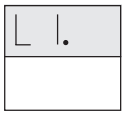
Fig. 10-2: Pin - Assignments X 3 (Digital Outputs)

10.1 Concentration Limits

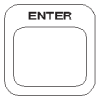
It may be assigned one upper and one lower concentration limit for each channel, freely selectable by the operator within the available concentration range.
The rightmost decimal of the related display will start to blink whenever a limiting concentration value is reached.
Additional digital signal outputs for the concentration limits are brought out to plug X 3 on the rear panel.(“Open Collector”, max. 30 V DC / 30 mA).

Depress the key 

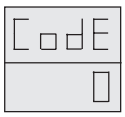
until the text



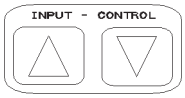
appears.

Depress the key 

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

the message 

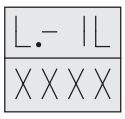
will appear.

Depress the keys 

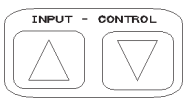
to select the correct **user code**,

enter with the 

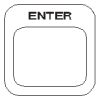
key.

The displays will now show 

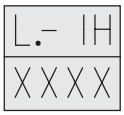
lower limit channel 1

Use the keys 

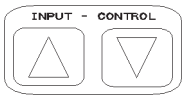
to set the limiting value.

Depress the key 

to enter the value.

There will then appear 

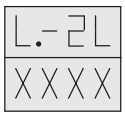
upper limit channel 1

Use the keys 

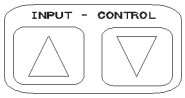
to set the limiting value.

Depress the key 

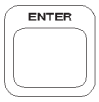
to enter the value.

The displays will now show 

lower limit channel 2

Use the keys 

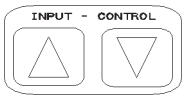
to set the limiting value.

Depress the key 

to enter the value.

There will then appear 

upper limit channel 2

Use the keys 

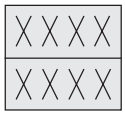
to set the limiting value.

Depress the key 

to enter the value.

Depress the key 

until

the displays show 

The analyzer is now back in the analysis display.

10.2 Valve Control

The valve control for operation with optional external solenoid valves will be done via plug X 3 on the rear panel, too (see Fig. 10-1 and 10-2).

10.3 Status Signals (Option)

The analyzer has been optionally equipped with two status signal outputs. These are fed to the 9-pin subminiature D-plug X 1 on the rear panel of the analyzer (see Item 9. and 13., too). These signals are non-voltage-carrying contacts with a maximal loading of 42 V / 1 A !.

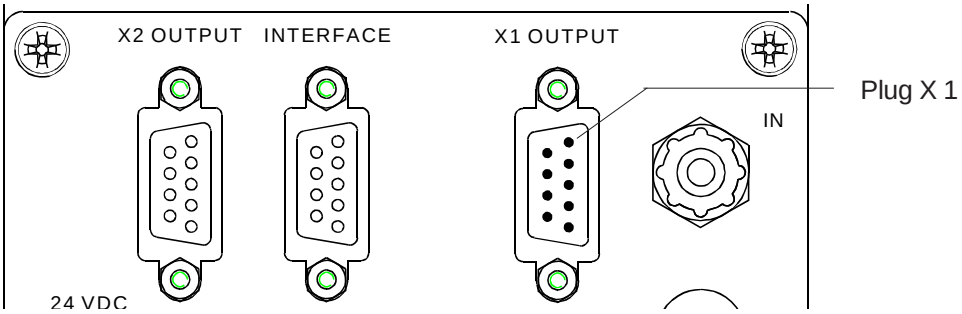


Fig. 10-3a: Plug X 1 (Status Signals) [OXYNOS® 100 with paramagnetic measurement]

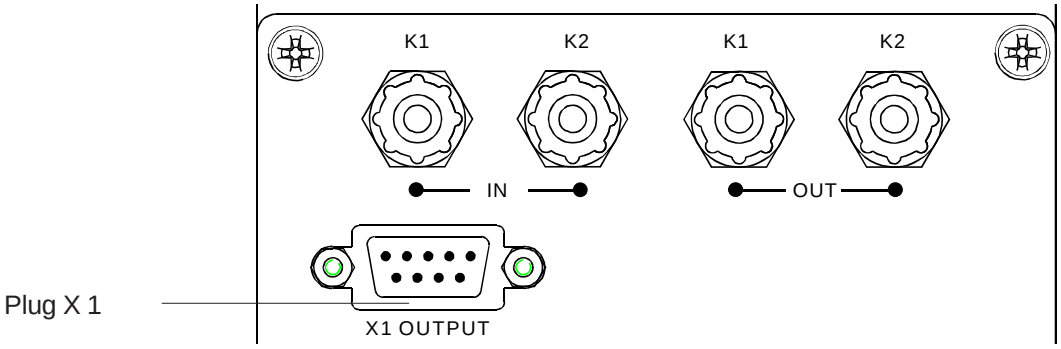


Fig. 10-3b: Plug X 1 (Status Signals) [OXYNOS® 100 with electrochemical measurement]

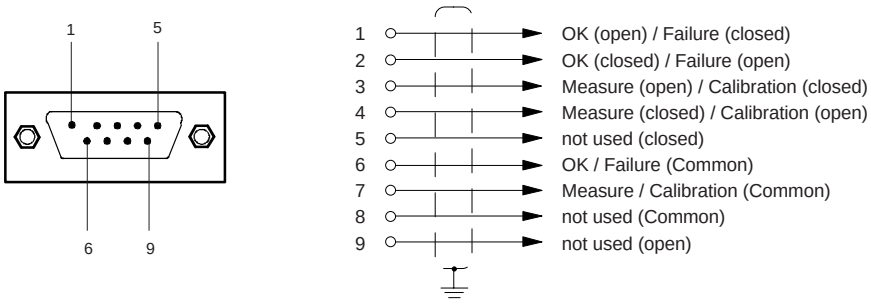


Fig. 10-4: Pin - Assignments X 1 (Status Signals)

11. Measurement / Switching Off

11.1 Measurement

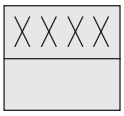
The primary step in the measurement of the concentration of a gas component is the admission of sample gas to the analyzer.

Analyzer warm-up after switching on takes about 50 minutes for paramagnetic measurement or about 10 minutes for electrochemical measurement !

❍ Admit sample gas at the gas inlet fitting.

❍ Set the gas flow rate to maxi. 1 l/min.

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



Note !
If some other 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 some other mode has been selected.

11.2 Switching Off

Before switching off the analyzer, we recommend first flushing the gas lines for about 5 minutes with zeroing gas (N_2) or adequate conditionned air. The full procedure for shutting down the analyzer is as follows:

- ❍ Admit zeroing gas at the gas inlet fitting.
- ❍ Set the gas flow rate to allowable rate.

After 5 minutes have elapsed:

- ❍ Shut Off the zeroing gas supply.
- ❍ Switch Off the analyzer by disconnecting the voltage supply.
- ❍ Close all gas line fittings immediately.

12. Serial Interface (Option)

12.1 Retrofitting of 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 Item 12.3.2, too)

Be sure to observe the safety measures !

❍ Opening the housing (see 21.)

❍ Connect circuit board to the threated bolts at the rear panel and mounting with the washers and the screws.

❍ Connect cable subject to code pin to BKS - pin connector **J9** .

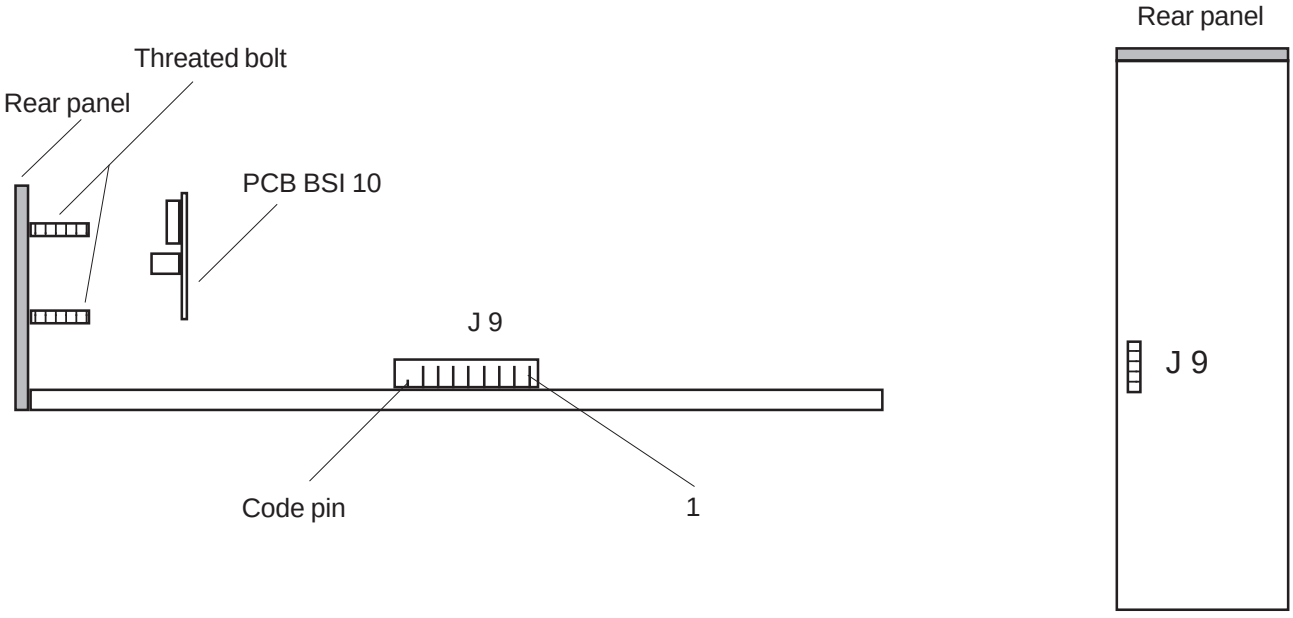


Fig. 12-1: Installation of PCB BSI 10

❍ For retrofitting serial interface insert enclosed EPROM (see Item 25.).

12.2 General

The analyzer is equipped with a serial interface enabling communications 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.

Communications are 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 **4.800 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“ on the analyzer rear panel (Fig. 12-2).

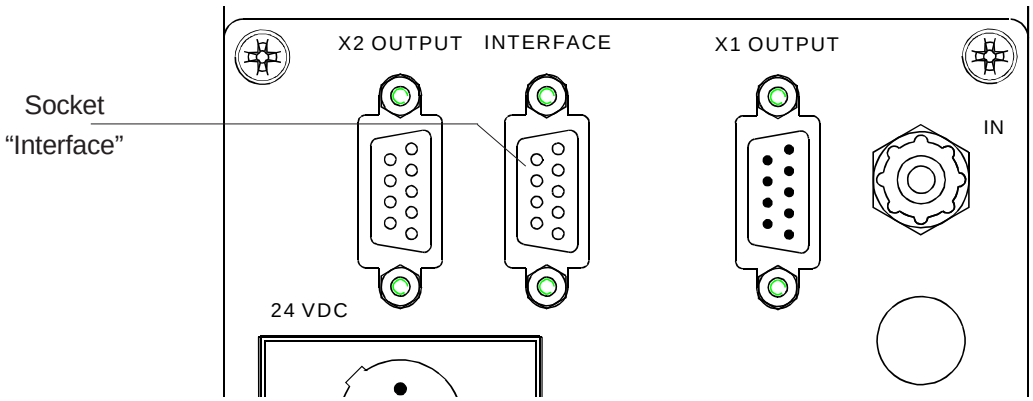


Fig. 12-2a: Socket “Interface” (Serial Interface) [OXYNOS® 100 with paramagnetic measurement]

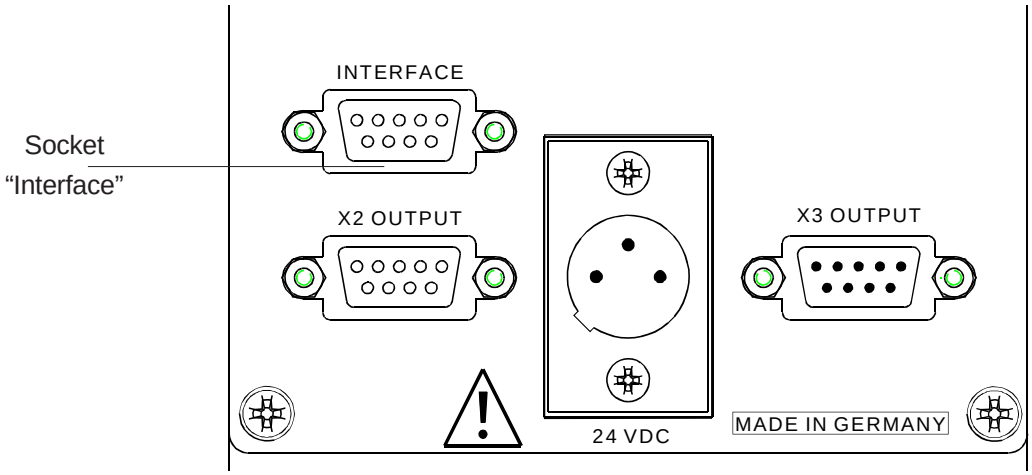


Fig. 12-2b: Socket “Interface” (Serial Interface) [OXYNOS® 100 with electrochemical measurement]

12.3.1 RS 232 C

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

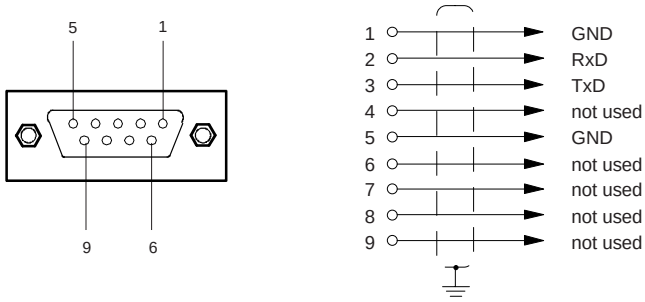


Fig. 12-3: Pin - Assignments "RS 232 Interface"

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 selcted. Connecting of [2 - 3] 4-wire-operation is active. Connect Jumper P2 at both ends of interface connection (termination). 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 remove the Jumper.

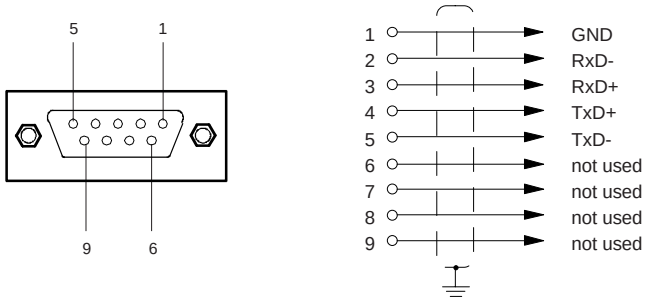


Fig. 12-4: Pin - Assignments "RS 485 Interface"

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 **"on - line"** or **"off - line"** status. This setting may be performed either from the keypad or via telegram input.

Keyboard setting:

SIP - parameter On.-L. = 1 for on - line status
SIP - parameter On.-L. = 0 for off - line status

Telegram setting:

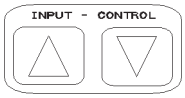
Instruction code 6: sets analyzer on - line status
Instruction code 7: sets analyzer off - line status

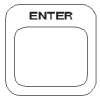
If the analyzer is set to **off - line** status, it will accept only instruction code 6. All other instructions will be ignored and result in transmission of appropriate status telegrams.

12.3.4 Setting Interface Parameters

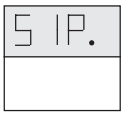
Agreement of interface parameters between analyzer and host computer is a fundamental requirement for communication without errors.
The following analyzer parameters are concerned:

- ❏ baud rate: 600 / 1.200 / 2.400 / 4.800 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 

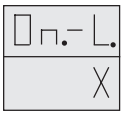
Depress the key 

until 

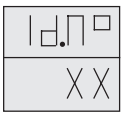
appears,

then depress the key 

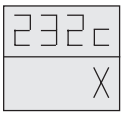
The unit is now ready for **code** entry, if such has not already been performed.



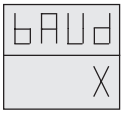
0 = off - line status
1 = on - line status



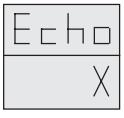
Each device is assigned a device number for operation through the RS 485 interface (0 - 99).



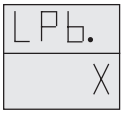
Select interface type:
0 = RS 485 1 = RS 232 C



Set baud rate:
0 = 4.800 1 = 2.400
2 = 1.200 3 = 600



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 OD)

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 off - line 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 Section 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 1	
m:	range number (for OXYNOS® 100 is invariably 1)	
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:	Instruction description:
$ID;001;k;LPB<CR>	RI stand-by status
$ID;002;k;LPB<CR>	RI sample gas valve open
$ID;003;k;LPB<CR>	RI zeroing gas valve open
$ID;005;m;k;LPB<CR>	RI span gas valve open
$ID;006;LPB<CR>	RI on - line status
$ID;007;LPB<CR>	RI off - line status
$ID;011;m;k;LPB<CR>	SP at full scale range
$ID;013;k;LPB<CR>	SP t_{90} (response time)
$ID;014;w;k;LPB<CR>	RP t_{90} (response time)
$ID;017;k;LPB<CR>	SP preflushing period
$ID;018;w;k;LPB<CR>	RP preflushing period
$ID;019;k;LPB<CR>	SP preflushing period
$ID;020;w;k;LPB<CR>	RP preflushing period
$ID;023;k;LPB<CR>	SP concentration
$ID;028;m;k;LPB<CR>	SP span gas concentration
$ID;029;w;m;k;LPB<CR>	RP span gas concentration
$ID;030;LPB<CR>	SP status messages
$ID;603;k;LPB<CR>	SP gas component
$ID;604;k;LPB<CR>	RI automatic zeroing
$ID;605;k;LPB<CR>	RI automatic spanning
$ID;606;0;LPB<CR>	RI automatic zeroing & spanning
$ID;607;LPB<CR>	SP absorber recovery cycles
$ID;627;LPB<CR>	SP failure message (possible error **batt**. is clearing by read out)
$ID;645;0;LPB<CR>	SP pressure value

12.5.2 Response Telegrams

Response telegrams follow with the same syntax as the appropiate (SP-) commands (see 12.5).

The response telegram for instruction

"$ID;030;LPB<CR> SP Status messages"

shows as follows:

$ID;030;a;b;c;LPB<CR>

This means:

a: OK-Status 0 = Relay without power 1 = Relay active

b: Value of variable "calibration" 0 = Relay without power >0 = Relay active

b	Meaning
0	No Calibration
1	Zeroing channel 1
2	Zeroing channel 2
3	Zeroing channel 1 + 2
4	Spanning channel 1
5	Spanning channel 2
6	Spanning channel 1 + 2
7	Spanning channel 1 first, then channel 2
8	reserved
9	reserved
10	Waiting for flushing time and t_{90} response time

c: Relay 3 0 = Relay without power 1 = Relay active

13. Error List

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).

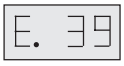
Note !
If there is an "error message", a digital status signal "Failure" can be given optional (see Item 10.3)!

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

Error Code	Possible Reasons	Check / Correct
No Display	1. Displays are “switched OFF”	1. Press any key. Check parameter dOFF (see 8.5).
	2. Voltage supply absent.	2. Check electrical supply (see Fig. A-2, Item 3).
	3. Connection front panel /BKS absent.	3. Check connection BKB - BKS (X1) (see 15.1).

Error Code	Possible Reasons	Check / Correct
Flushing  	Battery buffer faulty. The EPROM - default values were charged.	Check, if Jumper J 7 is plugged (see 16.). Exchange battery, if battery voltage < 3,5 V (BKS - Jumper J7 plugged). The error is clearing after depressing any key or with serial interface instruction $627.
 Channel 1  Channel 2 A/D-Conversion-End-Signal absent	1. Jumper not or incorrect plugged. 2. Positive or negative reference voltage absent. 3. Light barrier signal absent. 4. Supply voltage (internal 6 V DC) absent.	1. Channel 1: Check Jumper J1 Channel 2: Check Jumper J2 (see 16.) Switch analyzer off and then on again. 2. Check reference voltage (see 14.1.2/14.1.3). 3. Check measuring point 14.1.6 4. Check measuring point 14.1.1
 Temperature compensation inoperative	1. Start-up of A/D-conversion in temperature channel absent. 2. Supply voltage (internal 6 V DC) absent.	1. Switch analyzer off and then on again. 2. Check measuring point 14.1.1

Error Code	Possible Reasons	Check / Correct
 Channel 1  Channel 2 Tolerance error Zero-gas value deviates more than 10% of measuring range from zero.	1. Incorrect zero gas in use. 2. Analyzer not calibrated.	1. Check zero gas in use. 2. Switch off the tolerance check before starting an adjustment (see 8.4).
 Channel 1  Channel 2 Tolerance error Span-gas value deviates more than 10% from nominal value.	1. Incorrect nominal value. 2. Incorrect span gas in use. 3. Analyzer not calibrated.	1. Enter the correct nominal value (certification of span gas bottle) (see 9.1.2). 2. Check span gas in use. Use another or a new gas bottle. Enter the correct nominal value 3. Switch off the tolerance check before starting an adjustment (see 8.4).
 Channel 1  Channel 2 Measuring value more than 10% over full-scale range.	1. Concentration of measuring gas too high.	1. Check concentration of measuring gas. Use another analyzer suitable for the concentration-range involved.
	Parameter ABS. does not set to “0”.	Set parameter ABS. to “0” (see 8.16).
	Time - out for XON of serial interface.	At drive of serial interface XON - character is absent (Time - out > 60 s).

Error Code	Possible Reasons	Check / Correct
 Pressure sensor defective	1. Measuring range failure. 2. Connection faulty. 3. Pressure sensor faulty.	1. pressure not into the sensor measuring range (800 - 1100 hPa). 2. Check connection P1 (at BAF 01) / pressure sensor (see 15.). 3. Exchange pressure sensor.
 EPROM Checksummary defective	1. EPROM faulty. 2. BKS faulty.	1. Exchange EPROM (see 25.). 2. Exchange BKS.
 Test for RAM - IC's defective	RAM - IC's / BKS faulty.	Exchange BKS.
Analog output absent	BKS faulty.	Exchange BKS.
Fluctuating or erroneous display	1. Leakage into gas circuit. 2. Gas pressure subject to excessive fluctuations. 3. Oxygen senor is not connected. 4. Faulty analog preamplifiering. 5. Electrochemical sensor is already consumed.	1. Perform a leakage check. (see 20.). 2. Check the gas lines preceding and following the sensor cell. Eliminate any restrictions found beyond the gas outlet fitting. Reduce pumping rate or flow rate. 3. Check connections: BKS X5 / Sensor channel 1 BKS X6 / Sensor channel 2 (see 15.). 4. Check measuring point 14.1.5 or 14.2.1 resp. 5. Exchange sensor (see23.)

Error Code	Possible Reasons	Check / Correct
Fluctuating or erroneous display (continuation)	6. Contamination of the gas paths.	6. Check gas paths and gas conditionning to contamination.
	7. Barometric pressure effects.	7. Enter the correct value for barometric pressure (see 8.1). Pressure sensor faulty (E.37).
	8. Temperature below the dew point in the gas paths.	8. Check the temperature of the gas paths and eliminate any reason of condensation, Maintain all temperatures at values at least 10 °C above the dew point of sample gas.
	9. Faulty A/D - converter.	9. Exchange BKS.
Response - time too long (t_{90} - time)	1. Incorrect response time (t_{90} - time).	1. Check the value for t_{90} - time (see 8.9).
	2. Pumping rate inadequate.	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 5.1).
	3. Contamination of the gas paths.	3. Check gas paths and gas conditionning to contamination. Clean gas paths and exchange the filter elements.

14. Measuring Points of BKS and OXS

Be sure to observe the safety measures !

14.1 Measuring points of BKS

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

14.1.1 Supply Voltage + 6 V

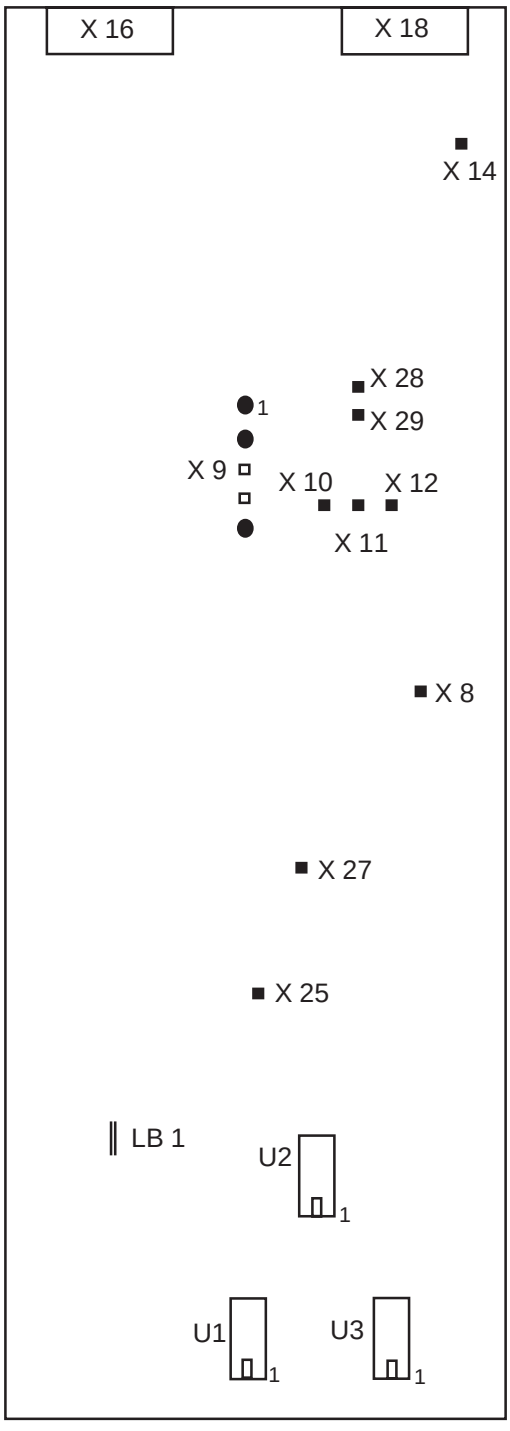
Measuring point: X 14
Measuring device: DVM
Signal: + 6 V DC (+10 / -200 mV)
(adjust with Potentiometer R 90, if necessary)

Failure: No signal

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

14.1.2 Reference Voltage positive

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



Front panel

14.1.3 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 ($U_{ref. pos.} + U_{ref. neg.} \leq \pm 10$ mV) !
If the difference is bigger, exchange BKS.

14.1.4 Temperature Sensor

Measuring point: X 8
Measuring device: DVM
Signal: approx. 0 ± 500 mV DC (at ambient temperature)

Failure. Signal > + 3,5 V DC

Possible reasons:
a) Temperature sensor not connected (see 15.).
b) Temperature sensor faulty (exchange sensor).
c) Broken cable of temperature sensor (exchange sensor).
d) BKS faulty (exchange BKS).

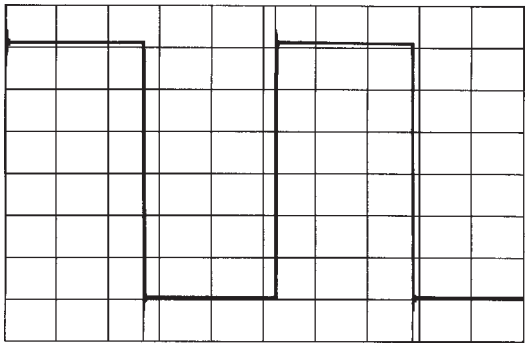
14.1.5 Analog Preamplifiering

Measuring point: X 25 (channel 1) / X 27 (channel 2)
Measuring device: DVM
Signal: At zero gas purge: 0 V DC (± 50 mV)
At ambient air purge: 500 mV DC (± 50 mV)

Failure: No signal or incorrect measuring values.

Possible reasons:
a) Oxygen sensor not connected (see 15.).
b) Oxygen sensor faulty or consumed (exchange sensor).
c) BKS faulty (exchange BKS).

14.1.6 **Light Barrier Signal** (Simulation)



Measuring point: Plug 9, pin 2
Measuring device: Oscilloscope
Signal: square impulse U = 6 V_{SS} (± 0,3 V)
Frequency = 24 Hz (± 0,1 Hz)

Failure: No signal

Possible reasons:
a) Solder bridge LB 18 is open.
b) BKS faulty (exchange BKS).

14.2 **Measuring points of OXS** (electrochemical measurement)

14.2.1 Sensor Signal

Measuring device: DVM

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

Signal: At ambient air (approx. 21 Vol. - % O_2): 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
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.

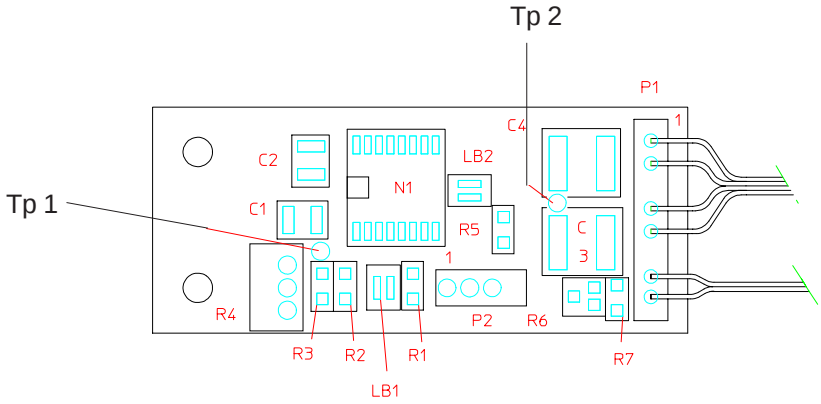


Fig. 14-1: PCB “OXS”, assembled, horizontal projection

15. Plug Pin Allocation of BKS and OXS

15.1 Plug Pin Allocation of BKS

P 1 oder P2 — 24 VDC - supply to heater of paramagnetic sensor

X 1 — Front panel BKB

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

X 6 — electrochemical measurement only:
Oxygen sensor channel 2
[PCB OXS channel 2
(cable P1, 5 - pin connector)]

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

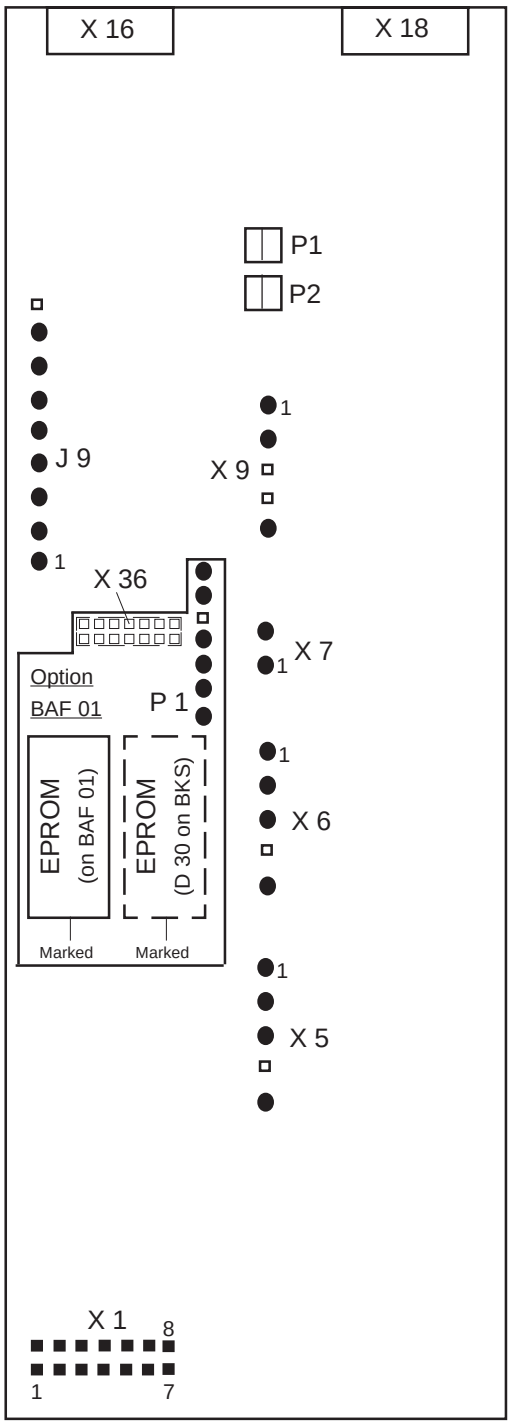
X 16 — Digital Outputs, parallel

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



Front panel

15.2 Plug Pin Allocation OXS (electrochemical measurement only)

1st measuring channel

Pin - base P2	Oxygen sensor
Cable P1, 5 - pin connector	PCB BKS, X 5 (sensor signal channel 1)
Cable P1, 2 - pin connector	PCB BKS, X 7 (temperature sensor)

2nd measuring channel

Pin - base P2	Oxygen sensor
Cable P1, 5 - pin connector	PCB BKS, X 6 (sensor signal channel 2)
Cable P1, 2 - pin connector	not used

View A: PCB OXS assembled, horizontal projection

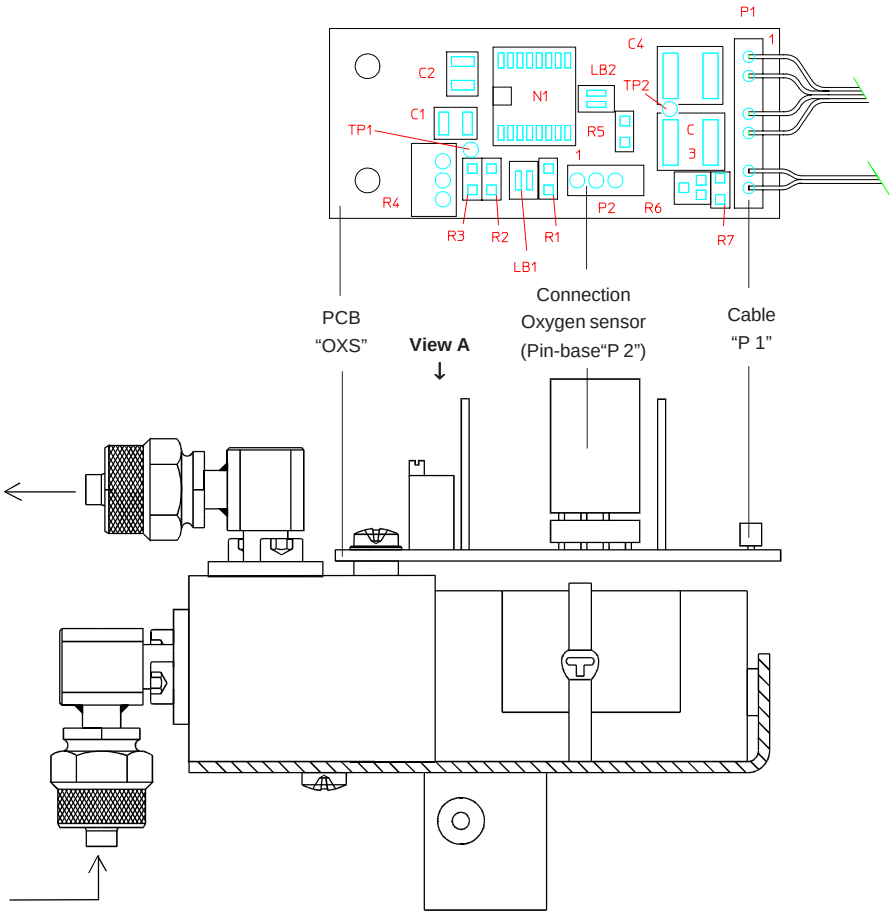


Fig. 15-1: PCB "OXS"

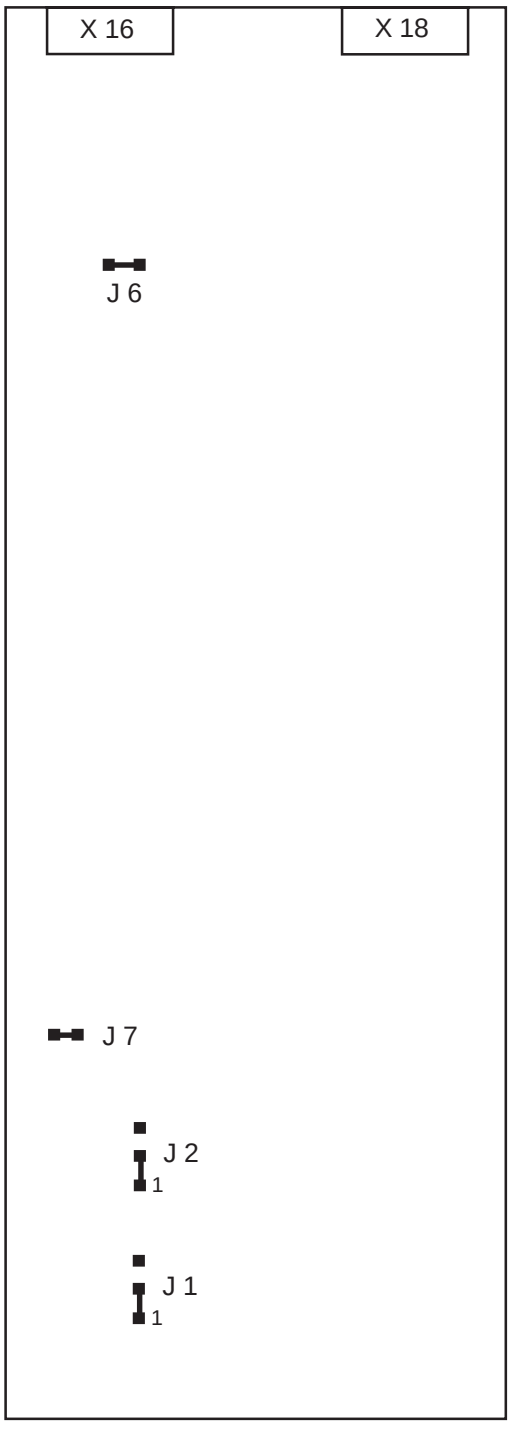
16. Jumper Allocation of BKS

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



Frontplatte

Maintenance

In general only the gas conditionning hardware will require maintenance; the analyzer itself requires very little maintenance.

The following checks are recommended for maintenance of the proper operation of the analyzer.

Check and adjust zero-level: weekly

Check and adjust span: weekly

Perform leak testing: 6 times annually.

The maintenance frequencies stated above are presented as guidelines only; maintenance operations may be required more or less frequently, depending upon usage and site conditions.

20. Leak Testing

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

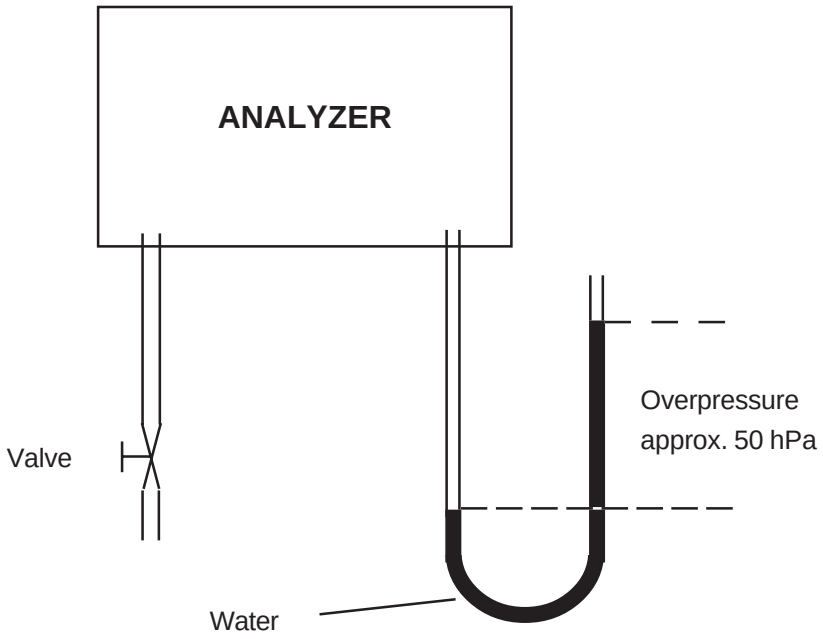


Fig. 20-1: Leak Testing with an U - Tube - Manometer

- ❍ Install a water - filled 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. 20-1).

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 maxi. 500 hPa !

21. Opening of the Housing

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

Be sure to observe the safety measures !

❍ Disconnect all voltage supplies.

❍ For table - top versions of the analyzer only

* Remove the rubber feet.
* Unscrew the screws shown in Fig A-1, Item 8.
* Remove the front mounting frame and carrying strap to rear.

❍ Unscrew the screws shown in Fig. A-1, Item 7 and Fig. A-2, Item 6.

❍ Remove the analyzer housing top cover panel.

Closing of the housing is performed in reverse order.

23. Check and Replacement of the electrochemical Sensors

Through measuring principle the oxygen sensor will have only a limited life time.

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

$$\text{life time} = \frac{\text{sensor time (hours)}}{O_2 \text{ - concentration (\%)}}$$

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

approx. 900.000 hours for sensor with a response time of about 12 s
approx. 450.000 hours for sensor with a response time of about 5 s

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

approx. 42.857 hours (approx. 5 years) for sensor with a response time of about 12 s
approx. 21.428 hours (approx. 2.5 years) for sensor with a response time of about 5 s

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

23.1 Check of the Sensors

Exchange the sensor, if the voltage is less than 70 % of the initially output voltage.

The check requires a digital voltmeter (DVM) with a range of 2 V DC.

- ❍ Open the analyzer housing (see Section 21.).
- ❍ Switch On the analyzer (see Section 6.).
- ❍ Admit ambient air to the analyzer (approx. 21 Vol. - O_2).
- ❍ Connect the DVM to the measuring points

  Tp 1 (signal) and Tp 2 (⊥) of circuit board OXS (see Fig. 23-3)

  The measuring signal should be into a range of 700 mV DC to 1000 mV DC.

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

23.2 Replacement of the Sensors

23.2.1 Removal of the Sensors

- ❍ Open the analyzer housing (see Section 21.).
- ❍ Disconnect all electrical connections between the PCBs OXS and BKS (X5, X6 and X7, see Item 15.).
- ❍ Remove all gas lines from the sensors.
- ❍ Unscrew both allen screws (fastening screws, see Fig. 23-1).
- ❍ Remove the complete support (see Fig. 23-1) to the top of the analyzer.

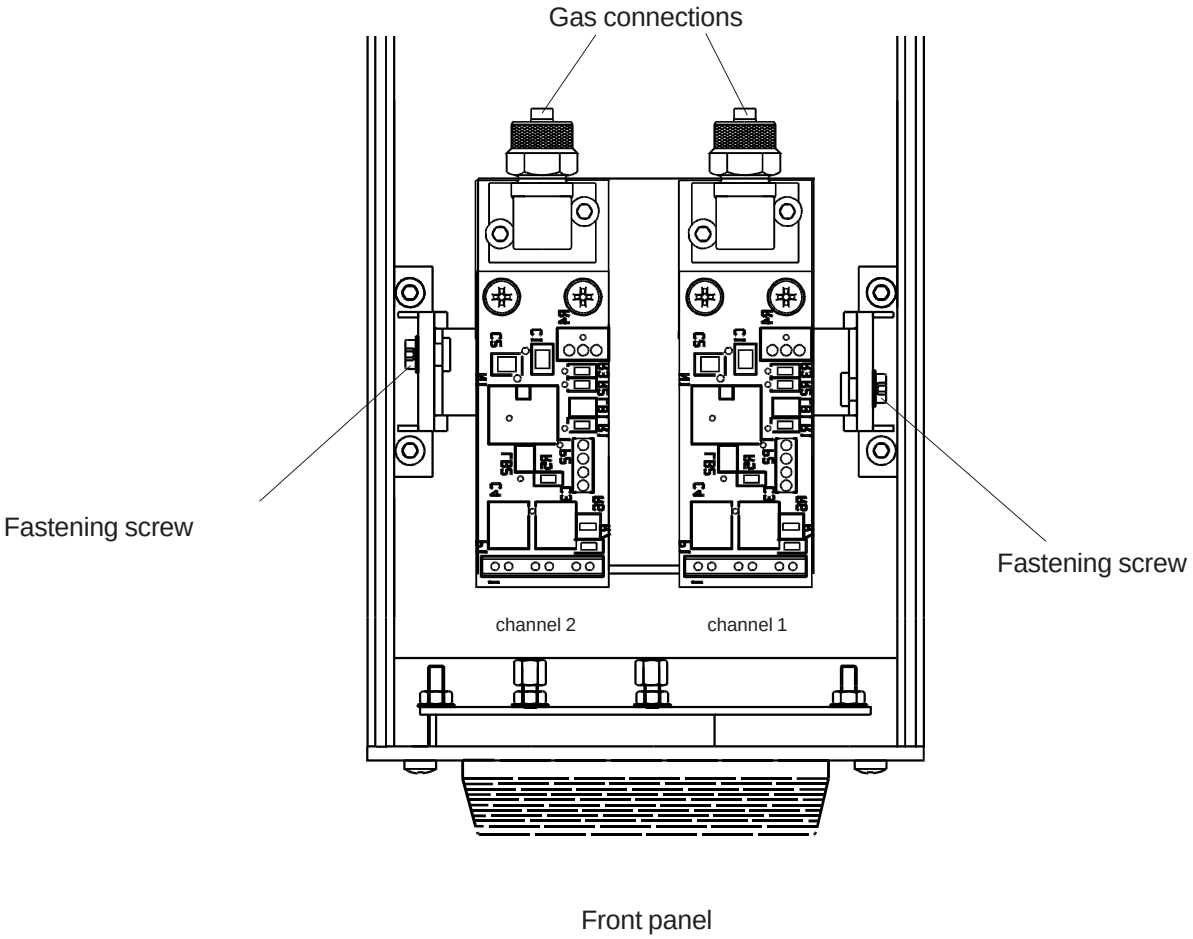


Fig. 23-1: Inside View OXYNOS® 100 (electrochemical measurement)

❍ Disconnect the connector for the sensor from “P2” of circuit board “OXS” (see Fig. 23-2).

❍ The cable clamp (see Fig. 23-2) is to cut through.

❍ Unscrew both fastening screws for the fitting (phillips screws, see Fig. 23-2).

❍ Remove the fitting including the sensor (see Fig. 23-2).

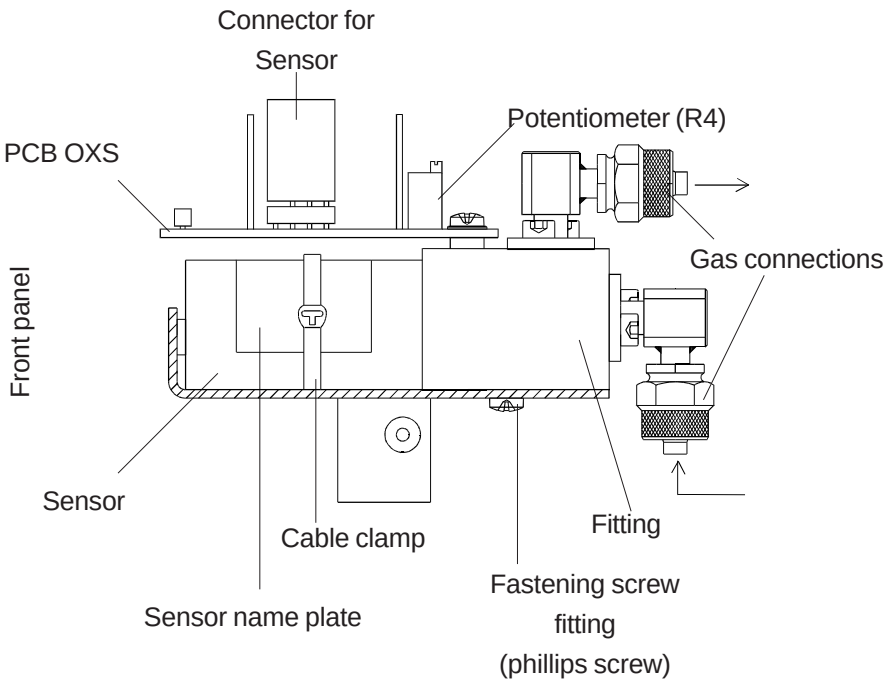


Fig. 23-2: Sensor support OXYNOS® 100 (electrochemical measurement)

23.2.2 Exchange of the Sensors

❍ Take the consumed sensor out of the fitting (see Fig. 23-2).

❍ Take off the stopper from new sensor and fit in the new sensor into the fitting, so that the name plate is at the top of the sensor.

❍ Close the spent sensor with the stopper and send it immediately to our factory.

23.2.3 Reinstalling of the Sensors

- ❍ Put the fitting with the (new) onto the support and screw with the two fastening screws (phillips screws, see Fig. 23-2)
- ❍ Fix the sensor with a cable clamp at the support (see Fig. 23-2).
- ❍ Connect the connector for the sensor to circuit board “OXS” (see Fig. 23-2).
- ❍ Insert the complete support (see Fig. 23-2) into the analyzer and screw with the two allen screws (fastening screws, see Fig. 23-1).
- ❍ Reconnect all electrical connections between OXS and BKS (X5, X6 and X7, see 15.).
- ❍ Reconnect all gas lines to the fittings (see Fig. 23-1 and Fig. 23-2).
  Do not interchange gas inlets and gas outlets.
- ❍ Perform a leakage test (see Section 20.) and set the sensor (see Section 23.2.4).

23.2.4 Basic conditions for the electrochemical Sensor

❍ Provide ambient air for the analyzer (approx. 21 Vol. - O_2) and switch on (see Section 6.).

❍ Connect the DVM to the measuring points

Tp 1 (signal) and Tp 2 (⊥) of circuit board OXS (see Fig. 23-3)

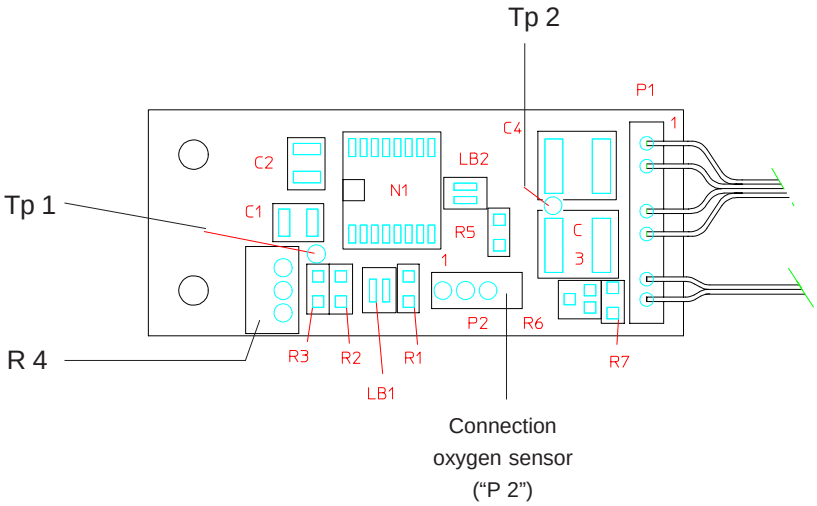


Fig. 23-3: PCB “OXS”, assembled, horizontal projection

❍ Set the signal to 1000 mV DC (± 5 mV) with potentiometer (R4) of the corresponding circuit board “OXS”.

Note !
It is not allowed to change this setting for this sensor again !

❍ Switch off the analyzer and close the analyzer housing (see 21.).

❍ A complete re-calibration of the instrument (see Section 9.) must be performed after a sensor - replacement.

24. Technical Data

Certifications	CE EN 50081-1, EN 50082-2
Suitability tests	TÜV Nord mbH, report-No.: 95CU054/B, LAI meeting from 20.09.96: Oxygen (O_2): TI Air, 13th BImSchV, 17th BImSchV DMT: (0-10 Vol.-% O_2) IBSD/PFG-Nr. 41300292
Measuring ranges	see order confirmation
paramagnetic sensor	0 - 5 to 0 - 100 % O_2 0 - 2 to 0 - 25 % O_2
electrochemical Sensor	0 - 25 % O_2 highest concentration range 0 - 5 % O_2 lowest concentration range
Dimensions	1/4 19" housing, 3 HU [see dimensional sketch (Fig. 24-1)]
Weight	approx. 5 kg

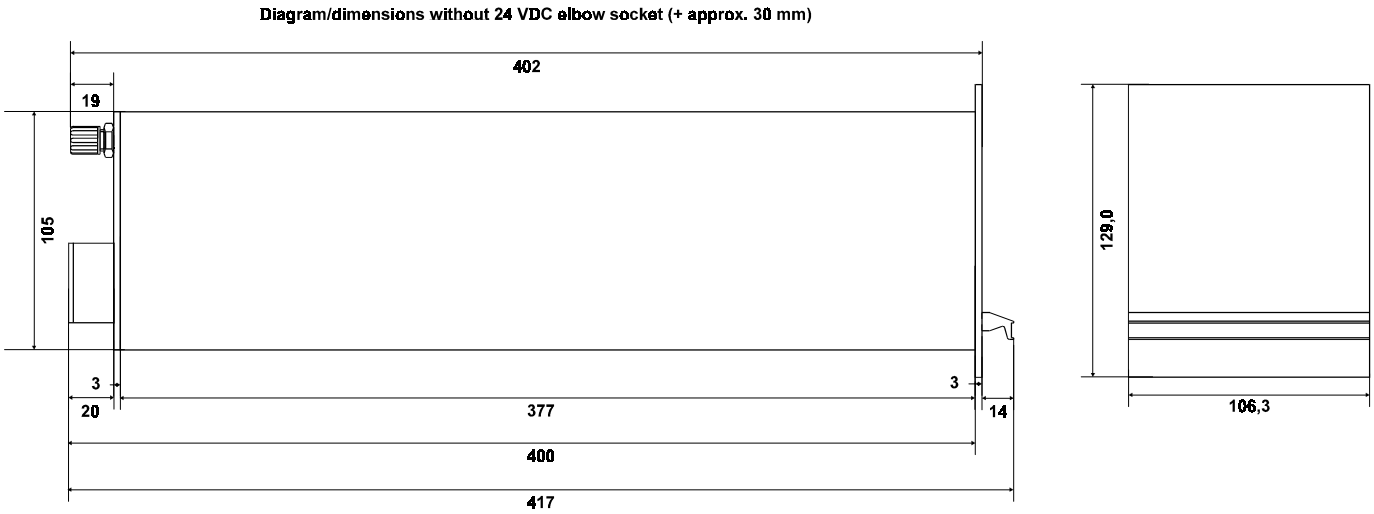


Fig. 24-1: Dimensional Sketch OXYNOS® 100

Signal Outputs, Interfaces

analog [(optically isolated), Offset and final concentration are free programmable]	0 - 10 V and 0 - 20 mA ($R_B \leq 500\ \Omega$) or 2 - 10 Vand 4 - 20 mA ($R_B \leq 500\ \Omega$), adjustable via keyboard
Option:	0 (0,2) - 1 V and 0 (4) - 20 mA ($R_B \leq 500\ \Omega$)
digital, parallel (optically isolated)	2 threshold contacts per channel Sample gas valve, Zero gas valve, Span gas valve 1, Span gas valve 2 “Open Collector”, max. 30 V DC / 30 mA
digital, seriell (Option)	RS 232 C or RS 485
Output Relays (Option)	“Measure/Calibration” and “Failure Analyzer” “non-voltage carrying contacts” max. 42 V/1 A

Cross sensitivities

electrochemical oxygen measurement

Do not use sample gases which contain FCHC !

paramagnetic oxygen measurement

100 % Gas	zero-level effect % O_2
N_2	0,00
CO_2	- 0,27
H_2	+ 0,24
Ar	- 0,22
Ne	+ 0,13
He	+ 0,30
CO	+ 0,01
CH_4	- 0,20
C_2H_6	- 0,46
C_2H_4	- 0,26
C_3H_8	- 0,86
C_3H_6	- 0,55
NO	+ 43,0
NO_2	+ 28,0
N_2O	- 0,20

	Paramagnetic Oxygen Sensor	**Electrochemical Oxygen Sensor**
Detection Limit	≤ 1 % [1) 4)]	≤ 1 % [1) 4)]
Linearity	≤ 1 % [1) 4)]	≤ 1 % [1) 4)]
Zero-point drift	≤ 1 % per week [1) 4)]	≤ 1 % per month [1) 4)]
Sensitivity drift	≤ 2 % per week [1) 4)]	≤ 1 % per week [1) 4)]
Resolution	≤ 1 % [1) 4)]	≤ 1 % [1) 4)]
Response time (t_{90}), electronically	2 - 60 s	2 - 60 s
Summary response time (t_{90})	< 3 s (increasing) [3)] < 4 s (decreasing) [3)]	12,2 - 62 s [3) 5)] (Option 6,0 - 60 s) [5) 6)]
Permissible gas flow	0,2 - 1.0 l/min	0,2 - 1.5 l/min
Influence of gas flow	≤ 2 % [1) 4)]	≤ 1 % [1) 4)]
Maxi. pressure	Atmospheric pressure	≤ 1.500 hPa
Influence of gas or barometric pressure (at constant temperature)	≤ 0,1% per hPa [2)]	≤ 0,1% per hPa [2)]
Option [8)]	≤ 0,01% per hPa [2)]	≤ 0,01% per hPa [2)]
Permissible ambient temperature	+5 °C to +40 °C [7)]	+5 °C to +40 °C
Influence of temperature (const. press.)		
on zero point	≤ 1 % per 10 K [1)]	≤ 1 % per 10 K [1)]
on sensitivity	≤ 2 % per 10 K [1)]	≤ 1 % per 10 K [1)]
Heated up to	approx. 55 °C	-
Heating-up time	approx. 50 minutes	approx. 10 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 inlet of analyzer at gas flow of approx. 1.0 l/min.
(electrically = 2 s)
4) pressure and temperature constant
5) dependend on integrated IR-detector / oxygen sensor
6) from gas inlet of analyzer at max. gas flow of approx 1.5 l/min.
7) higher permissible ambient temperatures on request
8) optional pressure sensor is required

24.1 Voltage Supply

Analyzer

Input	3-pole XLR- Flange (male), lockable
Voltage Supply	24 V dc (+ 20 / - 50 %)
[For ac operation {230/120 V}	the dc supply is to be provided by options VSE 2000, UPS, DP 157 or equivalent power supply]
Power Consumption	< 20 W (electrochemical measurement) < 40 W (paramagnetic measurement)

24.1.1 Electrical Safety

Over-voltage category	II
Pollution degree	2
Safety Class	2 (⧈)

24.1.2 Power Supplys [UPS 01 T (**U**niversal **P**ower **S**upply) / DP 157]

Input (UPS/DP 157)	plug / terminal strips
Nominal voltage	230 / 120 V ac, 50 / 60 Hz
Input voltage	196–264 V ac and 93–132 V ac, 47-63 Hz
UPS / DP 157	with autoranging / manual switch
Input power	
UPS / DP 157	max. 240 VA / max. 540 VA
Fuses UPS (internal)	T3,15A/250V (2 pcs.)
Output	3-poliger XLR- Flange (female) (UPS) / terminal strips (DP 157)
Output voltage	24 V dc
UPS / DP 157	max. 5,0 A / max. 10,0 A
Output power	
UPS / DP 157	max. 120 VA / max. 240 VA
Dimensions	see Fig. 24-2 and 24-3 160 x 130 x 120 mm [WxHxD] (DP 157)
Rack module (UPS)	19" 3 HU, 21 DU or 15 DU
Installation depth (with plug / cable)	min. 400 mm (UPS)
Installation of DP 157	Mountable on DIN supporting rails TS35

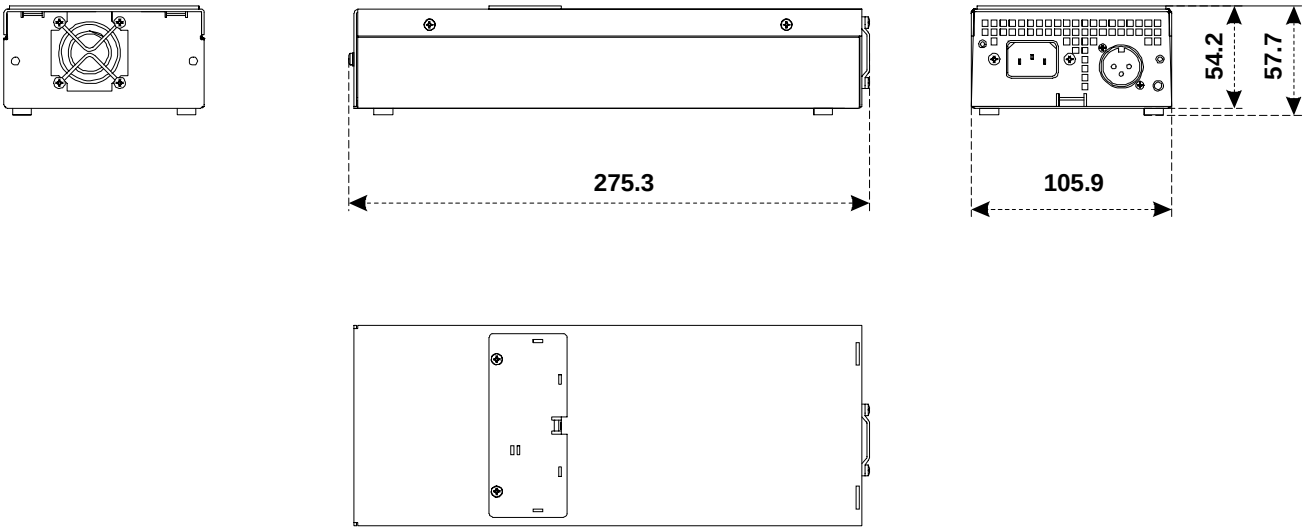


Fig. 24-2: Dimensional sketch UPS 01 T** (Universal Power Supply)**, table-top version
rack module turn around 90° [all dimensions in mm, without cable and plugs]

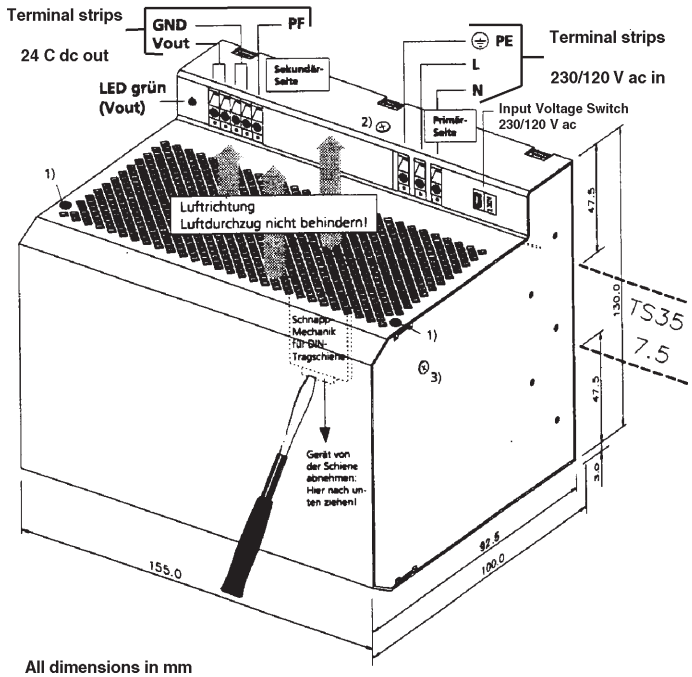


Fig. 24-3: Dimensional sketch DP 157 [mm]

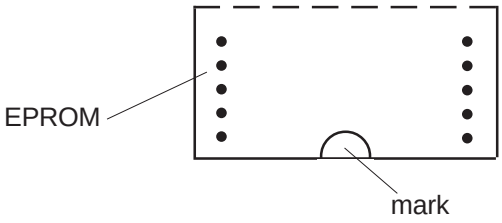
25. Replacing the EPROM

The EPROM may be readily replaced, either by a new unit when faulty, or by another which has been reprogrammed with an alternative program.

The EPROM - replacement procedure is as follows:

- ❍ Disconnect the analyzer from the source of electric power.
- ❍ Open the housing (see Section 21.).
- ❍ Remove jumper J7 (for the battery buffering; see the section 16.).
- ❍ Withdraw EPROM (D 15, section 15.).

Correctly orient the EPROM with respect to its socket before re-insertion.



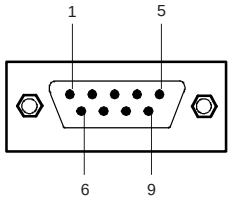
The EPROM will be inserted correctly, if the mark is shown to the front panel.

- ❍ Insert the EPROM.
- ❍ Reconnect jumper J7 (see the section 16.).
- ❍ Reconnect the instrument to the source of electric power and switch it on [see Section 6. (the displays must show a flushing "batt.")].

All data will now have been restored to default values. All user and application data, such as system parameters, limit - point values etc., must now be re-entered.

A complete re-calibration of the instrument (see Section 9.) must be performed after an EPROM - replacement.

Frontview of Connectors

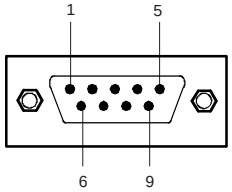


Plug X 3
9 - pin Sub. min. D

Digital Outputs (optically isolated)
“Open Collector”: max. 30 V DC / 30 mA

1	Limit channel 2 max.
2	Limit channel 2 min.
3	Limit channel 1 max.
4	Limit channel 1 min.
5	⊥
6	Valve control span gas 2
7	Valve control span gas 1
8	Valve control zero gas
9	Valve control sample gas

ME



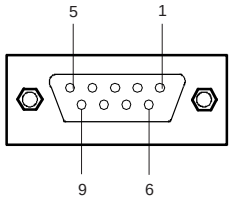
Plug X 1 (Option)
9 - pin Sub. min. D

Option “Output Relays”
(“non-voltage-carrying contacts”, max. 42 V / 1 A)

1	OK / Failure (NO)
2	OK / Failure (NC)
3	Measure / Calibration (NO)
4	Measure / Calibration (NC)
5	not used (NC)
6	OK / Failure (Common)
7	Measure/Calibration (Common)
8	not used (Common)
9	not used (NO)

ME

[NO = Normally OPEN]
[NC = Normally CLOSED]



Socket X 2
9 - pin Sub. min. D

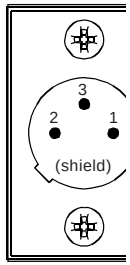
Analog Outputs (optically isolated)

1	⊥ (V DC)
2	0 (2) - 10 V DC [Option: 0 (0,2) - 1 V DC], channel 1
3	0 (4) - 20 mA, channel 1 ($R_B \leq 500\ \Omega$)
4	0 (2) - 10 V DC [Option: 0 (0,2) - 1 V DC], channel 2
5	0 (4) - 20 mA, channel 2 ($R_B \leq 500\ \Omega$)
6	⊥ (mA)
7	
8	
9	

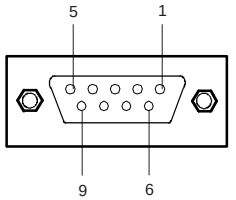
ME

Power Supply

U_N = 24 V DC (+ 20 % / - 50 %)



Pin 1:	ME
Pin 2:	+ 24 V DC (+ 20 % / - 50 %)
Pin 3:	0 V DC (GND)
shield:	housing flange



Socket “Interface” (Option)
9 - pin Sub. min. D

Option RS 232 C - Interface (optically isolated)

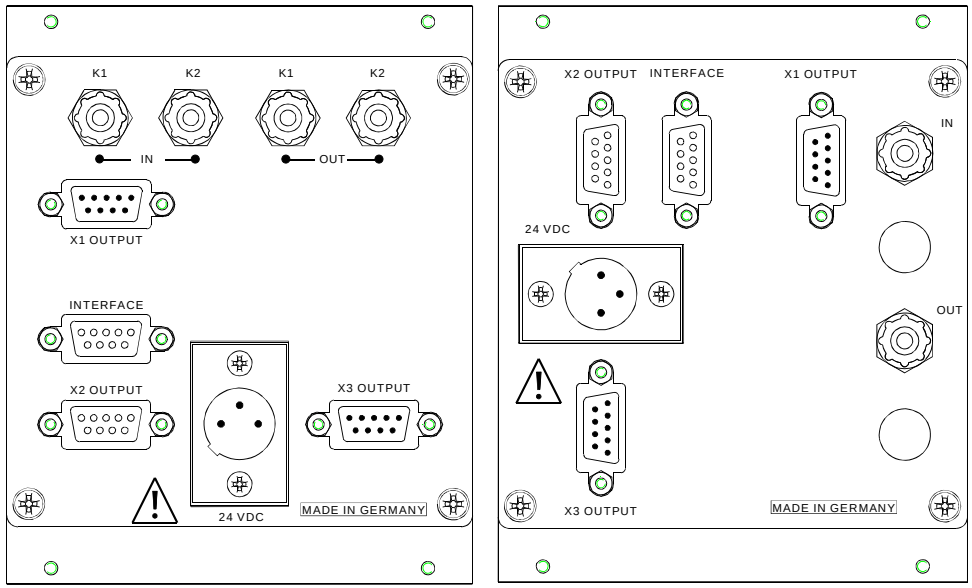
1	GND
2	RxD
3	TxD
4	not used
5	GND
6	not used
7	not used
8	not used
9	not used

ME

Option RS 485 - Interface (optically isolated)

1	GND
2	RxD-
3	RxD+
4	TxD+
5	TxD-
6	not used
7	not used
8	not used
9	not used

ME



Rear Panel OXYNOS® 100

X 1: Option “Output Relays”
(Sub.-min. D, 9 pin. plug)

X 2: Analog Outputs
(Sub.-min. D, 9 pin socket)

X 3: Digital Outputs
(Sub.-min. D, 9 pin plug)

Interface: Option “Interface” RS 232 C / RS 485
(Sub.-min. D, 9 pin socket)

Connection Cable 24 V DC
cable length approx. 1000 mm
one elbow socket, one straight plug,
Order-No.: CH 000 088

---

optionally terminal strip adaptors:

9-pin. sub.-min. D - socket to terminal strip
Order-No.: 00 019 494

9-pin. sub.-min. D - plug to terminal strip
Order-No.: 90 002 986

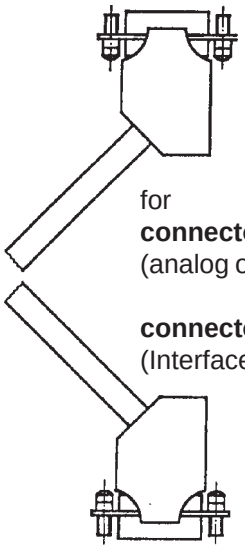
Combination of Cable / terminal strip adaptors:

combination of 43 008 001 and 00 019 494
Order-No.: NGA 000 59

combination of 43 008 006 and 90 002 986
Order-No.: NGA 000 62

---

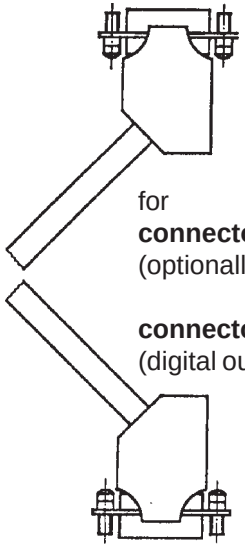
optionally Connection Cable
cable length approx. 2,0 m / double sided **plug**
Order-No.: 43 008 001



for
connector X 2
(analog outputs)

connector “Interface” (Option)
(Interface RS 232 C / RS 485)

optionally Connection Cable
cable length approx. 2,0 m / double sided **socket**
Order-No.: 43 008 006



for
connector X 1 (Option)
(optionally status signals)

connector X 3
(digital outputs)

Be sure to observe the safety measures !

29. Failure Check List

If there should be an error at the analyzer, please look for this failure check list, before establish in contact with us.
If you are send us the analyzer for removal of faults, enclose a copy of this list please.
This informations could simplify our trouble shooting and can lead to cost reduction.
It is possible to mark divers items with a cross.

Serial. - No.: _____
Measuring range channel 1: _____ channel 2: _____
Software - Version - No.: _____

1.	No Display (defective)	❑	17.	Analog Output absent	Ch1 ❑ CH2 ❑
2.	BATT. is flushing	❑	18.	Fluctuating display without error	CH1 ❑ CH2 ❑
3.	E 11 is flushing	❑	19.	Response - time to long	CH1 ❑ CH2 ❑
4.	E 12 is flushing	❑	20.	Measuring values to high	CH1 ❑ CH2 ❑
5.	E 14 is flushing	❑	21.	Measuring values to low	CH1 ❑ CH2 ❑
6.	E 16 is flushing	❑	22.	Misalignment Display/Analog output	CH1 ❑ CH2 ❑
7.	E 17 is flushing	❑	23.	Limiting values function incorrect	CH1 ❑ CH2 ❑
8.	E 18 is flushing	❑	24.	Adjustment not possible	CH1 ❑ CH2 ❑
9.	E 19 is flushing	❑	25.	Analyzer drift	CH1 ❑ CH2 ❑
10.	E 20 is flushing	❑	26.	Transverse sensitivity to high	CH1 ❑ CH2 ❑
11.	E 21 is flushing	❑	27.	Contamination of analyzer	CH1 ❑ CH2 ❑
12.	E 22 is flushing	❑	28.	Condensation	CH1 ❑ CH2 ❑
13.	E 27 is flushing	❑	29.	Overhaul complete analyzer <u>with</u> cost estimate	❑
14.	E 37 is flushing	❑	30.	Removal of failures <u>with</u> cost estimate	❑
15.	E 38 is flushing	❑	31.	Removal of failures <u>without</u> cost estimate	❑
16.	E 39 is flushing	❑			

Further tests of electronics (see section 14):

32. Supply voltage + 6 V incorrect ❑
33. Reference voltage positive incorrect ❑
34. Reference voltage negative incorrect ❑
35. Light barrier signal incorrect ❑
36. Temperature sensor incorrect ❑
37. Supply voltage + 18 V incorrect ❑
38. Analog preamplifiering incorrect ❑

39. You are satisfied with our services rendered ? Yes ❑ No ❑
(If no, give us a short comment please)

Comment or further failure description:

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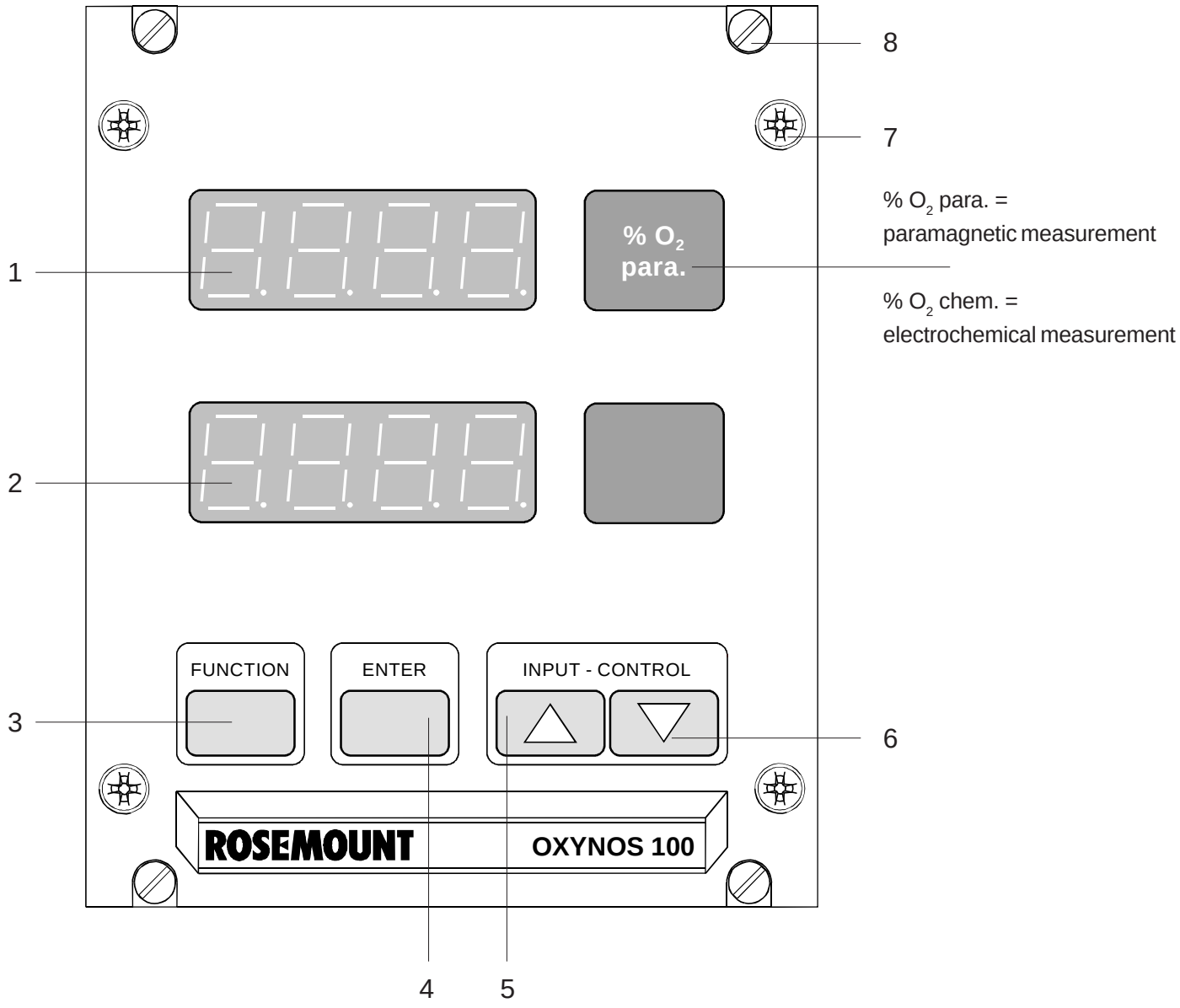

Fig. A-1: OXYNOS® 100, Front view

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

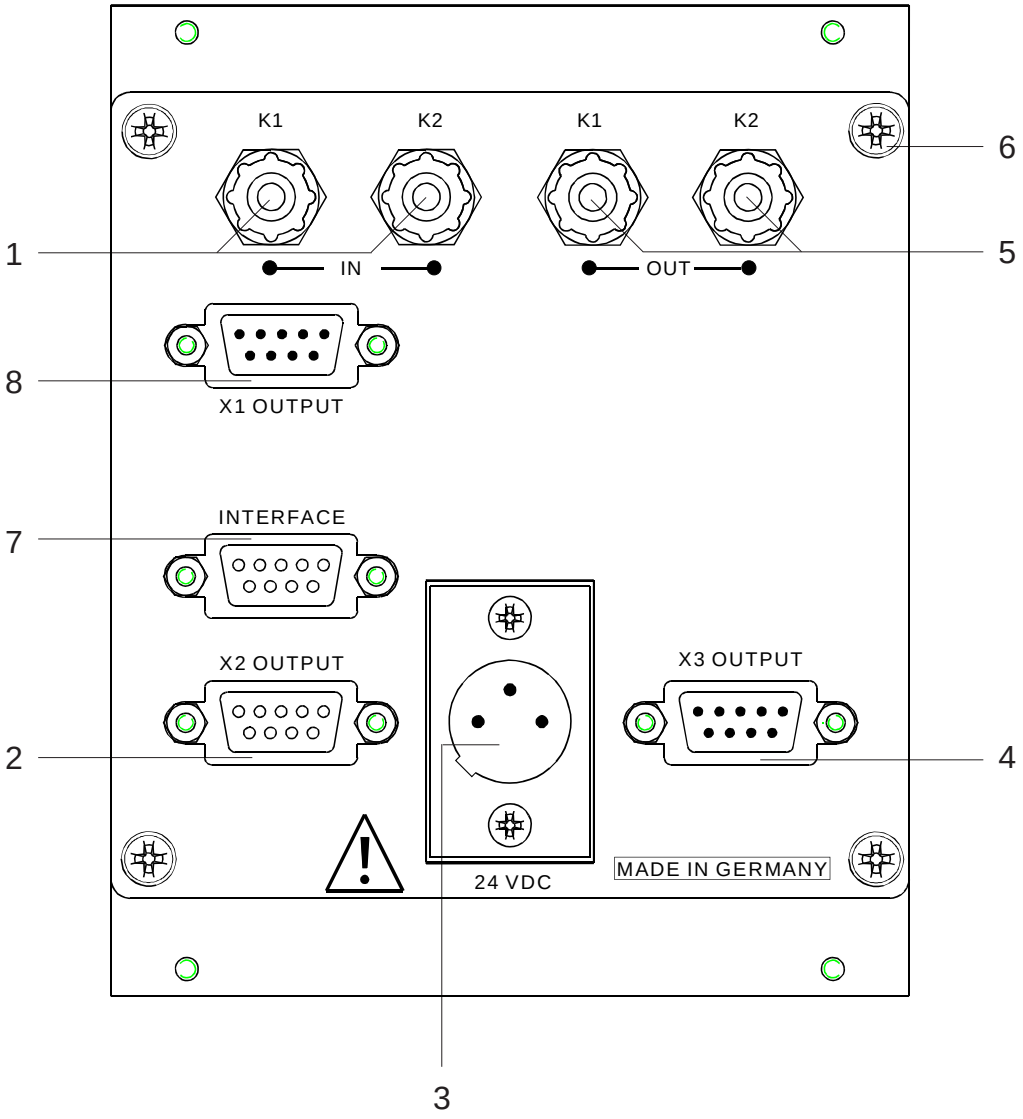

Fig. A-2a: OXYNOS® 100, Rear view (electrochemical measurement)

1 Gas inlet line fittings
2 **Analog signal output** mating socket
3 **24 V DC - 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)

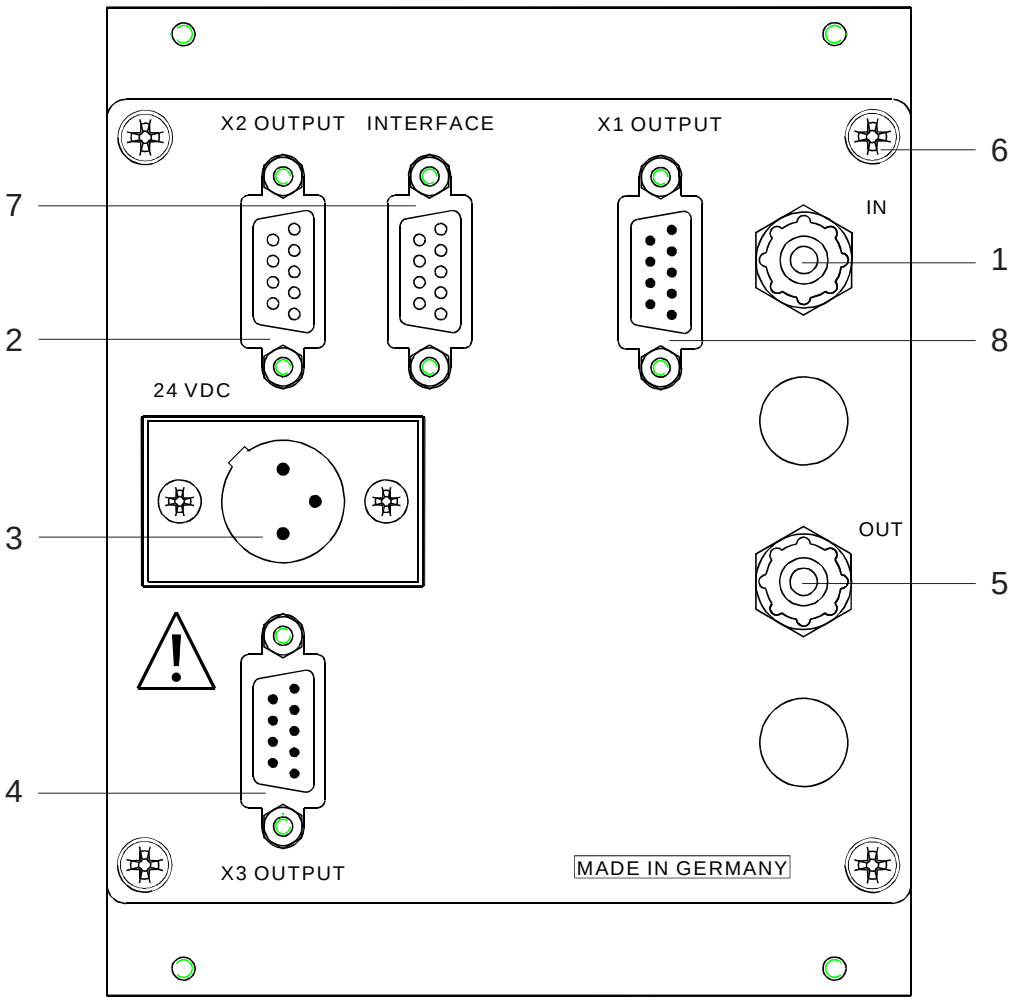

Fig. A-2b: OXYNOS® 100, Rear view (paramagnetic measurement)

1 Gas inlet line fittings
2 **Analog signal output** mating socket
3 **24 V DC - 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)