

EasyLine EL3000 Series Continuous Gas Analyzers Models EL3020, EL3040



Detectors with different measurement principles for numerous process and emission monitoring applications

Up to five measurement components per gas analyzer

Suitable for measuring flammable gases

Version with protection type II 3G for measurement of non-flammable gases

Performance-tested versions for emission monitoring according to Directive 2001/80/EC

QAL3 monitoring according to EN 14181 (optional)

Automatic calibration including pump and valve control

Simplified calibration with air or integral calibration cells eliminating the need for test gas cylinders

Customizable analog outputs, digital inputs and digital outputs

Modbus and Profibus interfaces

Simple menu-driven operator interface

Clear-text status messages

Configuration of rarely required functions with included configuration program

Self-monitoring function indicates when maintenance is required

Housing versions for 19-inch rack mounting (Model EL3020) and wall mounting (Model EL3040)

Integral gas feed (optional in Model EL3020)

Overview of the Gas Analyzers

Measuring Technology (Analyzers)

The following analyzers are available for selection:

- Uras26 infrared photometer for the measurement of infrared-active gas components e.g. CO, NO, SO₂
- Limas23 ultraviolet photometer for the measurement of NO, NO₂ and SO₂
- Magnos206 oxygen analyzer for the measurement of O₂ in process gas or in N₂
- ZO23 trace oxygen analyzer for the measurement of O₂ in pure gases (N₂, CO₂, Ar)
- Caldos27 thermal conductivity analyzer for the measurement of binary gas mixtures with different thermal conductivity e.g. Ar in O₂, H₂ in Ar, CH₄ in N₂
- Electrochemical oxygen sensor for the measurement of O₂

Magnos206 can also be used in combination with Uras26 or Limas23.

ZO23 cannot be used in combination with one of the other analyzers. Only one ZO23 can be installed in the gas analyzer.

Caldos27 can also be used in combination with Uras26.

The electrochemical oxygen sensor can only be used in combination with Uras26 or Limas23.

Each analyzer has one physical measurement range per sample component. A section of the physical measurement range can be mapped to the current output (analog output) by on-site configuration.

Calibration is always executed in the physical measurement range. The permissible measurement range limits are given by the specification of the smallest and largest measurement ranges for the individual analyzers.

A total of up to five measurement components can be measured with one gas analyzer.

Calibration

Calibration can be performed automatically or manually. Automatic calibration – for all sample components together – is normally started on a cyclically time-controlled basis; it can also be started by an external control signal or via the Modbus as well as manually on the display and operator control unit of the gas analyzer.

Normally, simplified calibration methods with the built-in calibration cells or the so-called single-point calibration are used for automatic calibration. If calibration with test gases is required the control of solenoid valves for switching on five test gases, zero gas and sample gas via digital outputs can be configured.

Integral Gas Feed

The integral gas feed (optional in Model EL3020) is available in two versions. It includes

- either the solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
- or a flow sensor module.

Electrical Interfaces

The electrical interfaces for the output of measured values and communication with external systems include

- The integrated Ethernet-10/100BASE-T interface (for configuration, software update and QAL3 data transfer)

as well as the integrated I/O modules depending on the functional range and order

- 2-way and 4-way analog output modules with two or four analog outputs,
- Digital I/O module with four digital inputs and four digital outputs,
- Modbus module with one RS485 and one RS232 interface,
- Profibus module with one RS485 and one MBP interface.

Housing Design

The housing for the EL3020 gas analyzer model is designed as a 19-inch housing with 3 height units and degree of protection IP20.

The housing for the EL3040 gas analyzer model is designed as a wall-mount housing with degree of protection IP65.

QAL3 Monitoring

QAL3 monitoring is available as an option in the gas analyzer. It is used to fulfill the requirements according to EN 14181 for storage and analysis of device adjustment data. The QAL3 monitoring option features the following functions:

- Automatic acquisition, verification and documentation of drift and precision at zero and reference points
- Reporting via CUSUM and Shewhart control charts
- QAL3 data storage in the gas analyzer (maximum 1 year)
- QAL3 data display and read-out as well as parameter setting via web browser
- Status messages on deviations beyond requirements
- Data export for further processing with spreadsheet programs

Infrared Photometer Uras26

Measurement Principle

Non-dispersive infrared absorption

Photometer to measure up to 4 components

Sample Components and Measurement Ranges

Sample Components and Smallest Measurement Ranges

Sample Component	Smallest Measurement Range
CO	0–100 ppm
CO ₂	0–100 ppm
NO	0–150 ppm
SO ₂	0–100 ppm
N ₂ O	0–100 ppm
CH ₄	0–100 ppm

Measurement Range Quantity

2 measurement ranges

Measurement Range Limits

Smallest Measurement Range	Largest Measurement Range
0–100 ppm (NO: 0–150 ppm)	0–500 ppm (NO: 0–750 ppm)
0–200 ppm	0–1000 ppm
0–600 ppm	0–3000 ppm
0–2000 ppm	0–10000 ppm
0–0.6 Vol.-%	0–3 Vol.-%
0–2 Vol.-%	0–10 Vol.-%
0–6 Vol.-%	0–30 Vol.-%
0–20 Vol.-%	0–100 Vol.-%

An individual measurement range within the limits shown in the table can be factory-set on special order.

Measurement ranges are freely adjustable within the limits shown in the table.

Measurement ranges should not be set within ignition limits.

Stability

The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They relate to the smallest measurement range.

Linearity Deviation

≤ 1 % of span

Repeatability

≤ 0.5 % of span

Zero Drift

≤ 1 % of span per week

Sensitivity Drift

≤ 1 % of measured value per week

Output Fluctuation (2 σ)

≤ 0.2 % of span at electronic T90 time (static/dynamic)
= 5/0 sec

Detection Limit (4 σ)

≤ 0.4 % of span at electronic T90 time (static/dynamic)
= 5/0 sec

Influence Effects

Flow Effect

Flow rate in the 20–100 l/h range: Within detection limits

Associated Gas Effect/Cross Sensitivity

The knowledge of the sample gas composition is necessary for the analyzer configuration.

Selectivity measures to reduce associated gas effect (optional): Incorporation of interference filters or filter cells, internal electronic cross-sensitivity correction for one sample component by other sample components measured with the gas analyzer.

Temperature Effect

Ambient temperature in permissible range

- At zero-point: ≤ 2 % of span per 10 °C
 - On sensitivity without thermostat: ≤ 3 % of measured value per 10 °C
 - On sensitivity with thermostat (optional): ≤ 2 % of measured value per 10 °C
- Thermostat temperature = 55 °C

Air Pressure Effect

- At zero-point: No effect
- On sensitivity with pressure correction by means of integral pressure sensor: ≤ 0.2 % of measured value per 1 % barometric pressure change

The pressure sensor is located in the sample gas path if hoses are used as the internal gas lines.

If stainless-steel tubing is used for internal gas lines the pressure sensor is routed to the outside via a hose.

Pressure sensor working range: $p_{\text{abs}} = 600\text{--}1250$ hPa

Power Supply Effect

Voltage and frequency in the permissible range: No effect

Infrared Photometer Uras26

Dynamic Response

Warm-Up Time

Approx. 30 minutes without thermostat; approx. 2 hours with thermostat

90% Response Time

T_{90} = 2.5 sec for measurement cell length = 175 mm, sample gas flow = 60 l/h and electronic T90 time (static/dynamic) = 5/0 sec

Calibration

Zero-Point Calibration

With inert gas, e.g. N_2 , or with ambient air that is free of the sample component.

End-Point Calibration

With gas-filled calibration cells (optional) or with test gas mixtures. It is recommended to verify the calibration cell set values once a year.

Materials in Contact with the Sample Medium

Analyzer (Sample Cells)

Tubing: Aluminum, Windows: CaF_2 or BaF_2 , Connectors: Stainless steel 1.4305 (SAE 303)

Gas Lines and Connectors

Hoses: FPM (Fluorocarbon rubber), Connectors: PVDF (Model EL3020) or stainless steel (Model EL3040). When flammable components are present in the sample gas: Tubes: Stainless steel 1.4571 (SAE 316Ti), Connectors: Stainless steel 1.4305 (SAE 303)

Gas Inlet Conditions

The analyzer must not be used for measurement of ignitable gas/air or gas/oxygen mixtures.

Temperature

The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required.

Inlet Pressure

p_e = 2–500 hPa

Lower pressures require a sample gas pump and higher pressures require a pressure reducer.

Outlet Pressure

Atmospheric pressure

Flow Rate

20–100 l/h

Corrosive Gases

Highly corrosive associated gas components, e.g. chlorine (Cl_2) and hydrogen chloride (HCl), as well as gases or aerosols containing chlorine must be cooled or undergo prior absorption.

Flammable Gases

In the version with gas lines and connectors made of stainless steel the analyzer is suitable for measuring flammable gases in general purpose environment. The special requirements must be observed (see operator's manual).

Gas Connections

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The version with two separate gas paths is used for NOx measurement with NO_2/NO converter connected upstream.

Note

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N_2 as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Ultraviolet Photometer Limas23

Measurement Principle

UV-RAS (UV Resonance Absorption Spectroscopy) method for sample component NO,
NDUV (Interference Filter Correlation) method for sample components NO₂ and SO₂

Photometer to measure up to 3 components

Sample Components and Measurement Ranges

Sample Components and Measurement Ranges

Sample Component	Smallest / Largest Measurement Range
NO	0...50 ppm / 0...5000 ppm
NO ₂	0...50 ppm / 0...500 ppm
SO ₂	0...100 ppm / 0...5 Vol.-%

The NO_x measurement value can be evaluated as the sum of the NO and NO₂ measurement values and output at an analog output. The NO_x measurement range results from the sum of the NO and NO₂ measurement ranges.

NO processed through a converter can be indicated as sample component "NO_x" on the display (factory-set).

For indication of the NO_x measurement value in mg/m³, the factor 1.53 is taken into account for conversion of NO to NO_x (factory-set).

Measurement Range Quantity
2 measurement ranges

Measurement Range Limits

Smallest Measurement Range	Largest Measurement Range
0...50 ppm	0...250 ppm
0...100 ppm	0...500 ppm
0...200 ppm	0...1000 ppm
0...400 ppm	0...2000 ppm
0...1000 ppm	0...5000 ppm
0...4000 ppm	0...20000 ppm
0...1 Vol.-%	0...5 Vol.-%

An individual measurement range within the limits shown in the table can be factory-set on special order.

Measurement ranges are freely adjustable within the limits shown in the table.

Stability

The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They relate to the smallest measurement range.

Linearity Deviation
≤ 1% of span

Repeatability
≤ 0.5% of span

Zero Drift

- For NO: ≤ 2% of span per week
- For NO₂ and SO₂: ≤ 3 ppm per week for measurement ranges ≤ 100 ppm (daily automatic baseline check is recommended), ≤ 2.5% of span per week for measurement ranges > 100 ppm

Sensitivity Drift

≤ 1% of measured value per week

Output Fluctuation (2 σ)

≤ 0.5% of span at electronic T90 time = 20 sec

Detection Limit (4 σ)

≤ 1% of span at electronic T90 time = 20 sec

Influence Effects

Flow Effect

Flow rate in the 20–100 l/h range: Within detection limits

Associated Gas Effect/Cross Sensitivity

The knowledge of the sample gas composition is necessary for the analyzer configuration.

Selectivity measures to reduce associated gas effect (optional): Internal adjustment or internal electronic cross-sensitivity correction for one sample component by other sample components measured with the gas analyzer.

Temperature Effect

Ambient temperature in permissible range

- At zero-point: ≤ 1% of span per 10 °C
- On sensitivity: ≤ 1.5% of measured value per 10 °C

Air Pressure Effect

- At zero-point: No effect
- On sensitivity with pressure correction by means of integral pressure sensor: ≤ 0.2% of measured value per 1% barometric pressure change

The pressure sensor is located in the sample gas path.

Pressure sensor working range: p_{abs} = 600–1250 hPa

Power Supply Effect

Voltage and frequency in the permissible range: No effect

Ultraviolet Photometer Limas23

Dynamic Response

Warm-Up Time

Approx. 2 hours

90% Response Time

$T_{90} \leq 3$ sec for measurement cell length = 220 mm, sample gas flow = 60 l/h and electronic T90 time = 0 sec

Calibration

Zero-Point Calibration

With inert gas, e.g. N₂, or with ambient air that is free of the sample component.

End-Point Calibration

With gas-filled calibration cells (optional) or with test gases (for each sample component). It is recommended to verify the calibration cell set values once a year.

Materials in Contact with the Sample Medium

Analyzer (Sample Cell)

Tubing: Aluminum, Windows: CaF₂, Connectors: Stainless steel 1.4305 (SAE 303)

Option: Tubing, windows and connectors made of quartz glass

Gas Lines and Connectors

Hoses: FPM (Fluorocarbon rubber), Connectors: PVDF (Model EL3020) or stainless steel (Model EL3040)

Gas Inlet Conditions

The analyzer must not be used for measurement of flammable gases and ignitable gas/air or gas/oxygen mixtures.

Temperature

The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required.

The internal temperature of the gas analyzer is at least 10 °C above ambient temperature.

Inlet Pressure

$p_e = 2-500$ hPa

Lower pressures require a sample gas pump and higher pressures require a pressure reducer.

Outlet Pressure

Atmospheric pressure

Flow Rate

20–100 l/h

Corrosive Gases

Highly corrosive associated gas components, e.g. chlorine (Cl₂) and hydrogen chloride (HCl), as well as gases or aerosols containing chlorine must be cooled or undergo prior absorption.

Gas Connections

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Note

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N₂ as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Oxygen Analyzer Magnos206

Measurement Principle

Paramagnetic behavior of oxygen

Magnetomechanical oxygen analyzer; short 90% response time

Sample Component and Measurement Range

Sample Component

Oxygen (O₂)

Smallest Measurement Range

0–2 Vol.-% O₂

Quantity and Measurement Range Limits

2 measurement ranges

Measurement ranges are freely adjustable; they are factory-set per order to 0–5 or 0–100 or 98–100 Vol.-% O₂.

Largest Measurement Range

0–100 Vol.-% O₂

Measurement ranges should not be set within ignition limits.

Measurement Ranges with Suppressed Zero-Point

Suppressed measurement ranges are freely adjustable in the range 0–100 Vol.-% O₂. Smallest span 2 Vol.-% O₂. The combination of a suppressed and an initial measurement range is not possible.

Pressure correction with a pressure sensor is required.

A pressure sensor is installed when the analyzer has been ordered with suppressed measurement range.

Stability

The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They are based on a span of 2 Vol.-% O₂.

Linearity Deviation

≤ 0.5 % of span

Repeatability

≤ 50 ppm O₂ (time base for gas exchange ≥ 5 minutes)

Zero Drift

≤ 3 % of span of the smallest measurement range (per order) per week, minimum 300 ppm O₂ per week; following prolonged transport and storage time the drift can be higher during the first weeks of operation.

Sensitivity Drift

≤ 0.1 Vol.-% O₂ per week or ≤ 1 % of measured value per week (not cumulative), whichever is smaller.

≤ 0.25 % of measured value per year, minimum 0.05 Vol.-% O₂ per year

Output Fluctuation (2 σ)

≤ 25 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Detection Limit (4 σ)

≤ 50 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Influence Effects

Flow Effect

≤ 0.1 Vol.-% O₂ in the 30–90 l/h range

Associated Gas Effect

The effect of associated gases as a shift of the zero-point – expressed in Vol.-% O₂ – can be estimated using the approximate values in the following table:

Associated Gas Concentration 100 Vol.-%		Zero-Point Shift in Vol.-% O ₂
Hydrogen	H ₂	+0.28
Hydrogen Sulfide	H ₂ S	–0.45
Argon	Ar	–0.26
Helium	He	+0.30
Neon	Ne	+0.13
Nitrogen	N ₂	0
Nitrogen Oxide	NO	+43
Nitrogen Dioxide	NO ₂	+28
Nitrous Oxide	N ₂ O	–0.20
Carbon Monoxide	CO	–0.01
Carbon Dioxide	CO ₂	–0.32
Carbon Oxysulfide	COS	–0.90
Ethane	C ₂ H ₆	–0.46
Ethylene	C ₂ H ₄	–0.29
Methane	CH ₄	–0.24
Propane	C ₃ H ₈	–0.98
Propylene	C ₃ H ₆	–0.55
Trichloroethane	C ₂ HCl ₃	–2.17
Vinyl Chloride	CH ₂ CHCl	–0.75

For further associated gases refer to EN 61207-3

Temperature Effect

Ambient temperature in the permissible range

– At zero-point: ≤ 1 % of span per 10 °C, ≤ 2 % of span per 10 °C in combination with Uras26

– On sensitivity: ≤ 0.2 % of measured value per 10 °C
Thermostat temperature = 64 °C

Air Pressure Effect

– At zero-point: No effect

– On sensitivity with no pressure correction:
≤ 1 % of measured value per 1 % air pressure change

– On sensitivity with pressure correction using integrated pressure sensor (optional):
≤ 0.01 % of measured value per 1 % pressure change or
≤ 0.002 Vol.-% O₂ per 1 % pressure change, whichever is greater
Pressure sensor working range: p_{abs} = 600–1250 hPa

Power Supply Effect

Voltage and frequency in the permissible range: ≤ 0.2 % of span

Position Effect

Zero-point shift ≤ 0.05 Vol.-% O₂ per 1° deviation from horizontal orientation. Position has no effect on the hard-mounted unit.

Oxygen Analyzer Magnos206

Dynamic Response

Warm-Up Time
< 1 hour

90% Response Time
 $T_{90} \leq 4$ sec at a sample gas flow of 90 l/h and electronic T90 time (static/dynamic) = 3/0 sec, gas change from N₂ to air

Calibration

Zero-Point Calibration
With oxygen-free process gas or substitute gas

End-Point Calibration
With process gas with a known oxygen concentration or a substitute gas such as dried air

Single-Point Calibration
Zero-point calibration with any oxygen concentration, e.g. with nitrogen (N₂) or ambient air, processed through a cooler or H₂O absorber.
Pressure correction by means of pressure sensor is recommended for single-point calibration with air.
Depending on the measurement task involved, the zero- and end-points should be verified periodically.

Calibration of Measurement Ranges with Suppressed Zero-Point
Highly suppressed measurement ranges (≥ 95 –100 Vol.-% O₂) should only be calibrated with test gases with concentrations in the selected measurement range.

Materials in Contact with the Sample Medium

Analyzer
Sample chamber (direct connection): Stainless steel 1.4305 (SAE 303), glass, platinum, rhodium, epoxy resin;
Seals: FPM (Fluorocarbon rubber), PEEK

Gas Inlet Conditions

The analyzer must not be used for measurement of ignitable gas/air or gas/oxygen mixtures.

Temperature
+5 to +50 °C
The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required. Water vapor content variations cause volume errors.

Inlet Pressure
 $p_e = 2$ –100 hPa
Lower pressures require a sample gas pump and higher pressures require a pressure reducer.

Outlet Pressure
Atmospheric pressure

Flow Rate
30–90 l/h
Abrupt changes in gas flow rates should be avoided when using highly suppressed measurement ranges.

Corrosive Gases
Consultation with ABB Analytical is required if the sample gas contains Cl₂, HCl, HF or other corrosive components.
The AO2000-Magnos206 analyzer should be used if the sample gas contains NH₃.

Flammable Gases
The analyzer is suitable for measuring flammable gases in general purpose environment. The special requirements must be observed (see operator's manual).

Gas Connections
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Note

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N₂ as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Trace Oxygen Analyzer ZO23

Measurement Principle

Potentiometric measurement; zirconium dioxide cell for determination of the oxygen concentration in accordance with Nernst's equation; reference gas: ambient air.

The analyzer is used for the continuous measurement of oxygen in pure gases (N₂, CO₂, Ar). The measuring cell is catalytically inactivated to the extent that flammable carrier components in stoichiometric concentrations only negligibly reduce the oxygen value.

Sample Component and Measurement Ranges

Sample Component

Oxygen (O₂)

Measurement Ranges

2 measurement ranges

Measurement ranges are freely adjustable within the 0...1 ppm to 0...250,000 ppm O₂ range; they are factory-set to 0 to 1/0 to 10 ppm O₂.

The following measurement data refer to a measurement span of 100 ppm O₂ with an integrated pump and flow control.

Stability

Linearity

Owing to the measurement principle, zirconium dioxide cells are base linear.

Repeatability

< 1 % of the measurement range or 100 ppb O₂ (whichever is greater)

Zero Drift

The zero point (reference point) is displayed if ambient air is present on the sample gas side. The value for air of 20.6 % Vol. of O₂ may deviate through aging of the cell.

< 1 % of the measurement range per week or 250 ppb O₂ (whichever is greater)

Sensitivity Drift

Depends on possible interfering components (catalyst poisons) in the sample gas and the aging of the cell.

For pure gas measurements in N₂ and Ar:

< 1 % of the measurement range per week or 250 ppb O₂ (whichever is greater)

Output Fluctuation (2 σ)

< ± 0.5 % of the measured value or 50 ppb O₂ (whichever is greater)

Influence Effects

Flow Effect

≤ 1 % of the measurement span or 100 ppb O₂ (whichever is greater) for a flow rate of 8 ± 0.2 l/h.

The flow rate must be kept constant to ± 0.2 l/h in the permissible range. The permissible range is 5 to 10 l/h. The flow rate is kept constant to 8 ± 0.2 l/h with integrated pump and flow control.

Associated Gas Effect

Inert gases (Ar, CO₂, N₂) have no effect. Flammable gases (CO, H₂, CH₄) in stoichiometric concentrations to the oxygen content: Conversion of O₂ < 20 % of the stoichiometric conversion. If higher concentrations of flammable gases are present, higher O₂ conversions must be expected. The concentration of flammable gases in the sample gas must not exceed 100 ppm.

Temperature Effect

The effect of the ambient temperature in the permissible range of +5 to +45 °C is < 2 % of the measured value or 50 ppb O₂ per 10 °C change in the ambient temperature (whichever is greater).

Air Pressure Effect

No effect through a change in air pressure; sample gas must flow out of the outlet without back pressure.

Power Supply Effect

24 V DC ± 5 %: no effect

Position Effect

No position effect for permanently installed instruments

Trace Oxygen Analyzer ZO23

Dynamic Response

Warm-Up Time

The operating temperature of the cell is reached after approx. 15 minutes. Offset calibration with reference gas (ambient air) after 2 hours flow. The measurement is ready-to-run after valves and lines have been purged with sample gas. Typical purging time for valves and lines: approx. 2 to 5 hours.

90% Response Time

$T_{90} < 60$ sec for the alternation of 2 test gases in the measurement range 10 ppm with a sample gas flow rate = 8 l/h and electronic T90 time = 3 sec

Calibration

Offset Calibration

The reference value for ambient air is calibrated at 20.6 Vol.-% O_2 (for 25 °C and 50 % relative humidity) by means of ambient air on the sample gas side.

End-Point Calibration

By means of test gas O_2 in N_2 (or in CO_2 or in Ar); O_2 concentration in the measurement range, e.g. 10 ppm O_2

Function Test

An extended response time or reduced sensitivity are dimensions for the correct functioning of the measuring cell. The function test can be carried out by feeding the sample gas without any additional test gases. On the basis of the progression of the test, it can be assessed whether the reaction time of the sensor lies within a specified tolerance. The function test is started manually and lasts approx. 15 min.

Materials in Contact with the Sample Medium

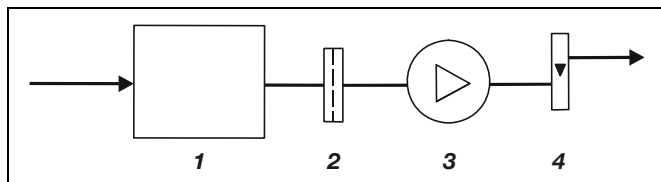
Analyzer

Zirconium dioxide cell: ZrO_2 , electrodes containing platinum;
Dust filter: PP; Pump: EPDM; Flow sensor: on semiconductor basis, nickel-plated brass

Gas Lines and Connectors

Stainless steel 1.4571 (SAE 316Ti), FPM and silicon hoses in the gas outlet; Gas connections: stainless steel 1.4401 (SAE 316)/1.4305 (SAE 303)

Pneumatics Diagram



- 1 Measuring cell
- 2 Dust filter (option)
- 3 Pump (option)
- 4 Flow sensor (option)

As an option, an integrated gas feed can be installed in the trace oxygen analyzer (see pneumatics diagram). The analyzer cannot be connected to the EL3000 series integral gas feed.

Gas Inlet Conditions

The analyzer must not be used for measurement of ignitable gas/air or gas/oxygen mixtures.

Temperature
+5 to +50 °C

Inlet Pressure
 $p_e = 2$ to 20 hPa

Outlet Pressure
Atmospheric pressure

Flow Rate
5 to 10 l/h. The flow rate must be kept constant to ± 0.2 l/h in this range.

The flow rate is kept constant to 8 ± 0.2 l/h with integrated pump and flow control. The sample gas must be taken from a bypass at zero pressure.

Corrosive Gases

The presence of corrosive gases and catalyst poisons, e.g. halogens, gases containing sulfur and heavy-metal dust, leads to faster aging and/or destruction of the ZrO_2 cell.

Flammable Gases

The concentration of flammable gases in the sample gas must not exceed 100 ppm.

Purge Gas

If case purging is selected, purging may only be carried out with air (not with N_2), since the ambient air is used as a reference gas.

Gas Connections

See page 23

Note

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N_2 as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Thermal Conductivity Analyzer Caldos27

Measurement Principle

Difference in thermal conductivity of various gases

Micromechanical silicon sensor with especially short T_{90} time

Largest Measurement Range

0–100 Vol.-% or 0 Vol.-% to saturation, depending on measurement task

Measurement ranges should not be set within ignition limits.

Sample Components and Measurement Ranges

Sample Component and Associated Gas	Smallest Meas. Range	Smallest Meas. Range With Suppr. Zero-Point
Air in Ar	0– 6 Vol.-%	94–100 Vol.-%
Ar in air	0– 6 Vol.-%	94–100 Vol.-%
Air in CO ₂	0–10 Vol.-%	90–100 Vol.-%
CO ₂ in air	0–10 Vol.-%	90–100 Vol.-%
Air in H ₂	0– 3 Vol.-%	–
H ₂ in air	0– 1 Vol.-%	–
Air in He	0– 3 Vol.-%	98–100 Vol.-%
He in air	0– 2 Vol.-%	97–100 Vol.-%
Ar in CO ₂	–	50–100 Vol.-%
CO ₂ in Ar	0–50 Vol.-%	–
Ar in H ₂	0– 3 Vol.-%	99–100 Vol.-%
H ₂ in Ar	0– 1 Vol.-%	97–100 Vol.-%
Ar in He	0– 3 Vol.-%	99–100 Vol.-%
He in Ar	0– 1 Vol.-%	97–100 Vol.-%
Ar in N ₂	0– 6 Vol.-%	94–100 Vol.-%
N ₂ in Ar	0– 6 Vol.-%	94–100 Vol.-%
Ar in O ₂	0–10 Vol.-%	90–100 Vol.-%
O ₂ in Ar	0–10 Vol.-%	90–100 Vol.-%
CH ₄ in H ₂	0– 3 Vol.-%	99–100 Vol.-%
H ₂ in CH ₄	0– 1 Vol.-%	97–100 Vol.-%
CH ₄ in N ₂	0– 6 Vol.-%	94–100 Vol.-%
N ₂ in CH ₄	0– 6 Vol.-%	94–100 Vol.-%
CO in H ₂	0– 3 Vol.-%	99–100 Vol.-%
H ₂ in CO	0– 1 Vol.-%	97–100 Vol.-%
CO ₂ in H ₂	0– 3 Vol.-%	99–100 Vol.-%
H ₂ in CO ₂	0– 1 Vol.-%	97–100 Vol.-%
CO ₂ in N ₂	0–10 Vol.-%	90–100 Vol.-%
N ₂ in CO ₂	0–10 Vol.-%	90–100 Vol.-%
H ₂ in N ₂	0– 1 Vol.-%	97–100 Vol.-%
N ₂ in H ₂	0– 3 Vol.-%	99–100 Vol.-%
H ₂ in NH ₃	0–10 Vol.-%	90–100 Vol.-%
NH ₃ in H ₂	0–10 Vol.-%	90–100 Vol.-%
He in N ₂	0– 2 Vol.-%	97–100 Vol.-%
N ₂ in He	0– 3 Vol.-%	98–100 Vol.-%

Measurement Ranges for Monitoring Hydrogen-Cooled Turbo Generators

Sample Component and Associated Gas	Measurement Range
CO ₂ in air or Ar in air	0–100 Vol.-%
H ₂ in CO ₂ or H ₂ in Ar	100–0 Vol.-%
H ₂ in air	100–80 Vol.-%

Other sample components on request.

Quantity and Measurement Range Limits

2 measurement ranges

Measurement ranges are freely adjustable within the limits shown in the table.

Stability

The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They relate to the smallest measurement ranges given in the table. The deviations may be larger for smaller measurement ranges.

Linearity Deviation

≤ 2 % of span

Repeatability

≤ 1 % of span

Zero Drift

≤ 2 % of smallest possible measurement range per week

Sensitivity Drift

≤ 0.5 % of smallest possible measurement range per week

Output Fluctuation (2 σ)

≤ 0.5 % of smallest measurement range span at electronic T90 time = 0 sec

Detection Limit (4 σ)

≤ 1 % of smallest measurement range span at electronic T90 time = 0 sec

Influence Effects

The following data relate to smallest measurement ranges given in the table. The influence effects will be larger at operating altitudes > 2000 meters.

Flow Effect

≤ 0.5 % of span at a flow change of ±10 l/h. At an identical flow rate for test and sample gases the flow rate effect is automatically compensated.

Associated Gas Effect

The knowledge of the sample gas composition is necessary for the analyzer configuration. If the sample gas contains components in addition to the sample component and associated gas (binary gas mixture), this will result in erroneous measurements.

Temperature Effect

Ambient temperature in the permissible range at each point in the measurement range: ≤ 1 % of span per 10 °C, based on temperature at the time of calibration
Thermostat temperature = 60 °C

Air Pressure Effect

≤ 0.25 % of span per 10 hPa for the smallest possible ranges given; for larger spans the effect is correspondingly lower.
Pressure sensor working range: $p_{\text{abs}} = 600\text{--}1250$ hPa

Power Supply Effect

Voltage and frequency in the permissible range: ≤ 0.2 % of span

Position Effect

< 1 % of span up to 30° deviation from horizontal orientation

Thermal Conductivity Analyzer Caldos27

Dynamic Response

Warm-Up Time

Approx. 30 minutes

90% Response Time

$T_{90} \leq 2$ sec at sample gas flow of 60 l/h and electronic

T90 time (static/dynamic) = 0/0 sec

Calibration

Zero-Point Calibration

With test gas, measurement component-free process gas or substitute gas

End-Point Calibration

With test gas, process gas having a known sample gas concentration or substitute gas

Single-Point Calibration

A single-point calibration can be performed with standard gas, since the zero- and end-points will not drift independently due to the sensor principle employed. This technique leaves out safety-related measurements. Depending on the measurement task involved, the zero- and end-points should be verified periodically (Recommendation: once a year).

Materials in Contact with the Sample Medium

Analyzer

Sample chamber (direct connection): Stainless steel 1.4305 (SAE 303); Sensor: Gold, silicon oxo-nitride; Seal: FFKM75 (Perfluoro rubber)

Gas Inlet Conditions

The analyzer must not be used for measurement of ignitable gas/air or gas/oxygen mixtures.

Temperature

+5 to +50 °C

The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required. Water vapor content variations cause volume errors.

Inlet Pressure

$p_e = 2-100$ hPa

Lower pressures require a sample gas pump and higher pressures require a pressure reducer.

Outlet Pressure

Atmospheric pressure

Flow Rate

Normally 10–90 l/h, minimum 1 l/h

Pressure Drop

< 2 hPa at 60 l/h N₂

Corrosive Gases

Consultation with ABB Analytical is required if the sample gas contains Cl₂, HCl, HF, SO₂, NH₃, H₂S or other corrosive components.

Flammable Gases

The analyzer is suitable for measuring flammable gases in general purpose environment. The special requirements must be observed (see operator's manual).

Gas Connections

See page 25

Note

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N₂ as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Electrochemical Oxygen Sensor

Measurement Principle

Electrochemical oxygen sensor

Sample Component and Measurement Range

Sample Component

Oxygen (O₂)

Smallest Measurement Range

0–5 Vol.-% O₂

Measurement Range

Factory-set to 0–25 Vol.-% O₂.

Adjustable from 0–5 Vol.-% O₂ to 0–25 Vol.-% O₂

Stability

Linearity Deviation

Linear in the range > 1 Vol.-% O₂

Repeatability

≤ 0.5 % of span

Zero Drift

Stable over long-term due to absolute zero point

Sensitivity Drift

≤ 1 % of the measurement range per week

Output Fluctuation (2 σ)

≤ 0.2 % of the measurement range at electronic T90 time
(static/dynamic) = 5/0 sec

Detection Limit (4 σ)

≤ 0.4 % of the measurement range at electronic T90 time
(static/dynamic) = 5/0 sec

Influence Effects

Flow Effect

Flow rate in the 20–100 l/h range:
≤ 2 % of the measurement range

Temperature Effect

Ambient temperature in the +5 to +40 °C range:
≤ 0.2 Vol.-% O₂ per 10 °C

Air Pressure Effect

- At zero-point: No effect
 - On sensitivity with no pressure correction:
≤ 1 % of measured value per 1 % air pressure change
 - On sensitivity with pressure correction:
≤ 0.2 % of sample value per 1 % air pressure change
- Pressure correction is only possible if the oxygen sensor is connected to the Uras26 infrared photometer with an integral pressure sensor.

Power Supply Effect

Voltage and frequency in the permissible range: ≤ 0.2 % of span

Dynamic Response

90% Response Time

T₉₀ ≤ 30 sec at sample gas flow of 60 l/h and electronic

T90 time (static/dynamic) = 5/0 sec

Calibration

Zero-Point Calibration

The oxygen sensor zero is not calibrated since it is fundamentally stable.

End-Point Calibration

With ambient air at 20.96 Vol.-% O₂

Materials in Contact with the Sample Medium

Sensor

Polystyrol-ABS, PTFE, FPM (Fluorocarbon rubber)

Housing Body

PVC, FPM (Fluorocarbon rubber) seals

Gas Ports

Stainless steel 1.4571 (SAE 316Ti)

Gas Inlet Conditions

The oxygen sensor must not be used for measurement of flammable gases and ignitable gas/air or gas/oxygen mixtures.

Temperature

The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required.

Moisture Content

H₂O dew point ≥ 2 °C

The oxygen sensor should not be used with dry sample gas.

Inlet Pressure

p_e = 2–500 hPa

Outlet Pressure

Atmospheric pressure

Flow Rate

20–100 l/h

Associated Gas

The oxygen sensor should not be used if the associated gas contains the following components: H₂S, chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, and base components.

Notes

The electrochemical oxygen sensor can only be used in combination with Uras26 or Limas23. It cannot be used when the internal gas lines in the Uras26 are made up of stainless steel pipes.

The performance characteristics of the analyzer have been determined according to the international standard IEC 1207-1: 1994 "Expression of performance of gas analyzers". They are based on N₂ as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.

Integral Gas Feed

Versions

The integral gas feed (optional in Model EL3020) is available in two versions. It includes

- either the solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
- or the flow sensor module.

The integral gas feed cannot be installed when the internal gas lines are made up of stainless steel pipes. It cannot be used in combination with Limas23 or ZO23.

Test Gas Supply

Type

3/2-way solenoid valve

Power Consumption

Approx. 3 W

Materials in Contact with the Sample Medium

PVDF, FPM

Gas Feed

Type

Magnetic piston pump

Feed Rate

Max. of 60 l/h, depending on the analyzer type and inlet/outlet pressure

Flow Rate

Adjustable

Power Consumption

Approx. 10 W

Materials in Contact with the Sample Medium

PVDF, EPDM, stainless steel 1.4571 (SAE 316Ti)

Flow Monitor

Type

Miniature flow sensor

Materials in Contact with the Sample Medium

Al₂O₃, silicon, gold, GFK

Gas Inlet Conditions

The integral gas feed modules must not be used for measurement of flammable gases and ignitable gas/air or gas/oxygen mixtures.

Temperature

+5 to +45 °C

The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required.

Flow Rate

30–60 l/h

Corrosive Gases

Corrosive associated gas components and aerosols must be cooled or undergo prior absorption.

General Data

Housing

	Model EL3020	Model EL3040
Version	19-inch housing	Wall-mount housing
Protection Type	IP20	IP65
Materials		
Housing	Galvanized sheet steel	Stainless steel 1.4016 (SAE 430)
Outer surfaces varnished		
Analyzer Rear Panel	Aluminum, PVC-C	Aluminum, PVC-C
Keypad Sheet	Polyester	Polyester
Colors	Light gray (RAL 7035), basalt gray (RAL 7012)	
Weight	approx. 7–15 kg	approx. 13–21 kg
Dimensions	see page 26	see page 27

Housing Purge

Possible only with Model EL3040 (wall-mount housing). Housing purge is mandatory when measuring flammable gases (see page 16). Purge gas flow during operation min. 10 l/h, max. 20 l/h. Purge gas pressure $p_g = 2\text{--}4$ hPa.

Display and Operation

Display

Backlit graphics display with 240 x 160-pixel resolution

Measured value display

- Numerical value with physical unit, also with bar graph indication in single display
- Resolution better than 0.2 % of the measurement span
- Simultaneous display of up to 5 measured values
- Flow: bar graph indication

Status display

Symbols in the display; the active status messages can be accessed directly from the measured value display

Operation

5 keys (cursor cross and OK); menu-assisted operation

Concept of Operation

The functions required in normal operation are operated and configured directly on the gas analyzer. The functions which are only seldom required, e.g. during start-up, are configured offline using the software tool ECT ("EasyLine Configuration Tool" on the enclosed CD-ROM) and then loaded into the gas analyzer.

Measuring Range Switch-Over and Feedback

There are three ways of executing the measuring range switch-over:

- Manually on the gas analyzer
- Automatically (autorange) by means of appropriate configured switch-over thresholds
- Externally controlled via appropriately configured digital inputs.

The measuring range feedback can be implemented via appropriately configured digital outputs; it is independent of the selected type of measuring range switch-over.

The gas analyzer is set ex works to measuring range 2 and to manual measuring range switch-over.

Limit Value Monitoring

Limit values can be set using the software tool ECT. The limit value signals (alarms) are output via digital outputs.

General Data

Pressure Sensor

Use

Standard for Uras26, Limas23 and Caldos27,
option for Magnos206

Materials in Contact with the Sample Medium

Silicon gel, plastics, FPM (Fluorocarbon rubber)

Fine Filtration

Version

Disposable filter with Borosilicate glass microfiber filter
element (supplied as accessory)

Retention Rate

99.99 % for particles > 0.1 µm

Materials in Contact with the Sample Medium

Polyamide, borosilicate glass with PVDF binder

Electrical Safety

Tested per EN 61010-1:2001

Protection Class I

Overvoltage Category / Pollution Degree

Power supply: III/2

Other circuits: II/2

Safe Isolation

The power supply is galvanically isolated from other circuits
by means of reinforced or double insulation. Operational low
voltage (PELV) on low-voltage side

Electromagnetic Compatibility

Noise Immunity

Tested to EN 61326-1:2006. Inspection severity: Industrial
area, fulfills at least the rating "continuously monitored
operation" to Table 2 of EN 61326.

Emitted Interference

Tested to EN 61326-1:2006, EN 61000-3-2:2006 and
EN 61000-3-3:1995 + A1:2001 + A2:2005. Limit value class B
for interference field strength and interference voltage is met.

Mechanical Stress

Operation

Vibration test to EN 60068-2-6:1996

Vibrations up to 0.5g/150 Hz have no influence on the
measured value. In Uras26, slight transient effects on the
measured value can occur in the region of the modulation
frequency.

Transport

Vibration test to EN 60068-2-6:1996,

shock test to EN 60068-2-27:1995

In its original packaging, the gas analyzer will withstand
normal shipping conditions.

Ambient Conditions

The gas analyzer is intended for indoor installation only.

Ambient Temperature

Operation: +5 to +45 °C

Uras26 in combination with another analyzer: +5 to +40 °C

Limas23: +5 to +40 °C

Storage and transport: -25 to +65 °C

Relative Humidity

< 75 %, slight condensation allowed

Air Circulation

For sufficient air circulation, multiple housings in a 19-inch
rack must be installed with a separation of at least one height
unit between housings.

Installation Location Altitude

Max. 2000 m above sea level (over 2000 m on request)

Power Supply

Input Voltage

100–240 V AC (– 15 %, + 10 %); 50–60 Hz ± 3 Hz

Power Consumption

Max. 187 VA

Connection

3-pin plug per EN 60320-1/C14; connection cable supplied

Version for Measurement of Flammable Gases

In the version with gas lines and connectors made of stainless
steel the gas analyzer (Models EL3020 and EL3040) with Uras26,
Magnos206, Caldos27 and ZO23 (concentration max. 100 ppm)
is suitable for measuring flammable gases in general purpose
environment. In Model EL3040, housing purge with nitrogen or
air must be provided. The special requirements must be
observed (see operator's manual).

Version with Protection Type II 3G for Installation in Hazardous Location for Measurement of Non-flammable Gases and Vapors

The gas analyzer (Model EL3040) with Uras26, Magnos206 and
Caldos27 is tested for explosion protection. It is suitable for
installation in hazardous locations when the technical data and
the special requirements (see operator's manual) are observed.

The gas analyzer may be used for measurement of non-flammable
gases and vapors. It is marked according to the Directive 94/9/EC
with

 II 3G Ex nAC II T4 X

In undisturbed operation there cannot be any sparking, arcing or
impermissible temperatures inside the device. Explosion
protection through: Non-sparking instruments and devices with
low power consumption; sealed or encapsulated devices

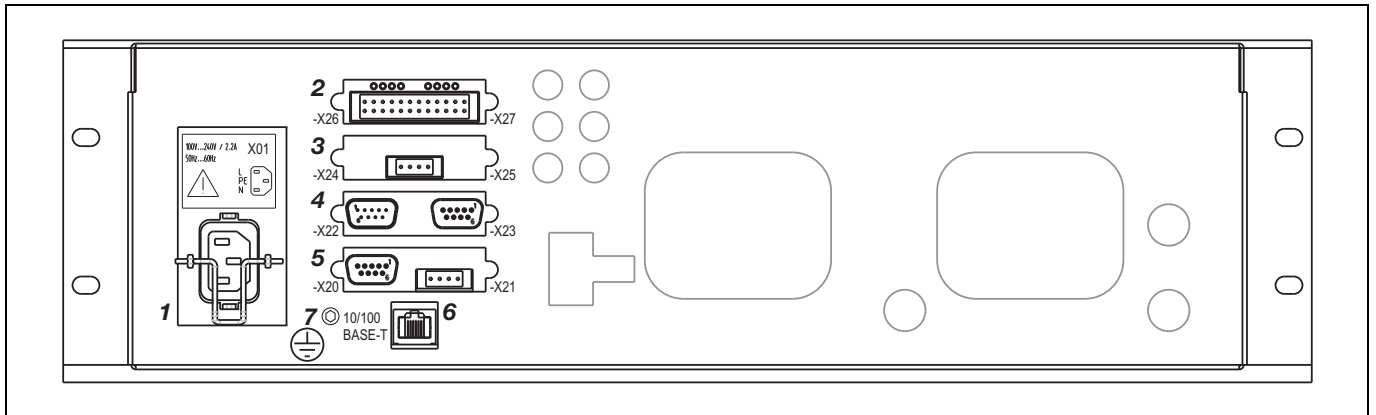
Judgment according to EN 60079-15:2005: Electrical apparatus
for explosive gas atmospheres – Part 15: Type of protection "n",
Sections 1 to 16, 19, 20, 22, 23, 29

Marking according to EN 60079-15:2005, Section 35

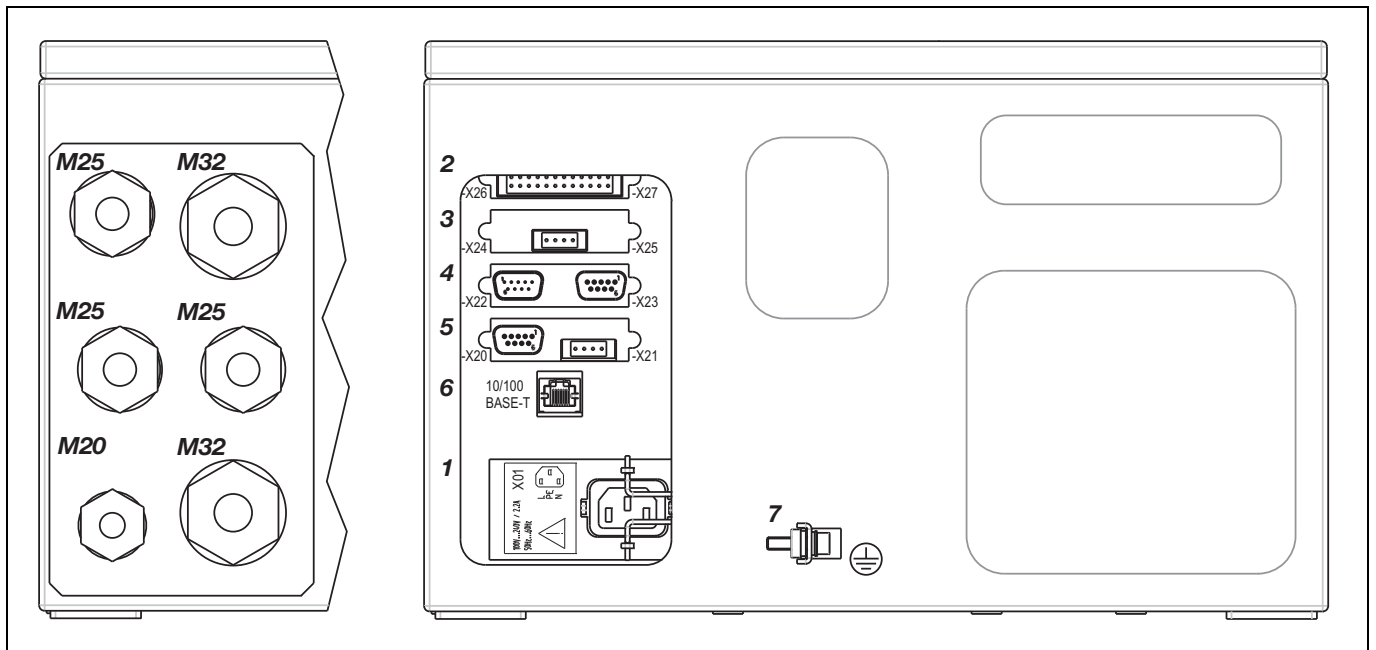
Housing Degree of Protection IP65

Electrical Connections

Power Supply and Signal Lines Model EL3020 (View from behind)



Power Supply and Signal Lines Model EL3040 (View from below)



- 1** Power Supply Connection (3-pin plug per EN 60320-1/C14; connection cable supplied)
- I/O Modules (4 slots), Options:
- 2** Digital I/O Module (max. 3 modules)
- 3** Analog Output Module (max. 2 modules)
- 4** Modbus Module (RS232 and RS485 interface)
- 5** Profibus Module (RS485 and MBP interface)
- 6** Ethernet-10/100BASE-T Interface (8-pin RJ45 plug)
- 7** Potential Compensation Connection (max. 4 mm²)

Screwed Cable Glands for Cable Diameter:

M20 Power Supply	5–13 mm
M25 Modbus/Profibus	8–17 mm
M25 Network	8–17 mm
M25 Analog Outputs	8–17 mm
M32 Digital Inputs/Outputs	12–21 mm
M32 Digital Inputs/Outputs	12–21 mm

Notes

Both drawings show examples for the I/O modules equipment.

I/O Module Connection:

- The maximum capacity of terminals for stranded or solid conductors is 1 mm² (17 AWG).
- The stranded conductor may be tinned on the tip or twisted for simplified connection.
- When using wire end ferrules the total section should not exceed 1 mm², i.e. the maximum stranded conductor section is 0.5 mm². The Weidmüller PZ 6/5 crimping tool must be used for crimping the ferrules.

Functional Scope of the Ethernet Interface:

- Communication with configuration software ECT for gas analyzer configuration and software update.
- QAL3 data transfer if the QAL3 monitoring option is integrated in the gas analyzer.

I/O Modules

Profibus Module

Electrical Connections

RS485 Interface:

- 1 – not used
- 2 M24 24 V Output Ground, max. 0.2 A
- 3 RxD/TxD-P Receive/Transmit Data Plus, B-Line
- 4 – not used
- 5 DGND Data Transmission Potential (Ref. Pot. for VP)
- 6 VP Supply Voltage Plus (5 V)
- 7 P24 24 V Output Voltage Plus
- 8 RxD/TxD-N Receive/Transmit Data N, A-Line
- 9 – not used

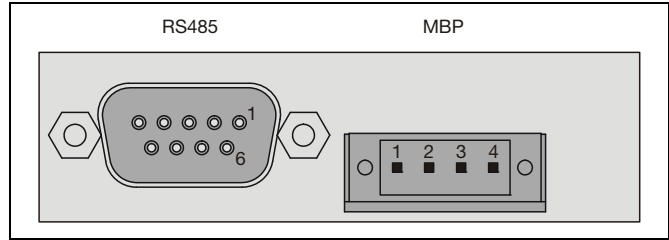
Design: 9-pin Sub-D female connector

MBP Interface (non-intrinsically safe):

- 1 +
- 2 Shield
- 3 –
- 4 not used

Design: 4-pin terminal strip. Observe the notes regarding I/O module connection (see page 17)!

Connection Diagram



Modbus Module

Electrical Connections

RS232 Interface:

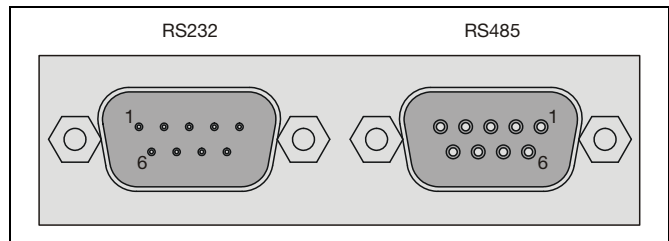
- 2 RxD
 - 3 TxD
 - 5 GND
- Design: 9-pin Sub-D male connector

RS485 Interface:

- 2 RTxD-
- 3 RTxD+
- 5 GND

Design: 9-pin Sub-D female connector

Connection Diagram



Analog Output Modules

Analog Outputs (AO1 to AO4)

0/4–20 mA (configurable, factory-set to 4–20 mA), common negative pole, galvanically isolated from ground, freely connectable to ground, max. gain relative to protective ground potential 50 V, max. working resistance 750 Ω. Resolution 16 bit. The output signal cannot be lower than 0 mA.

Terminal Assignment

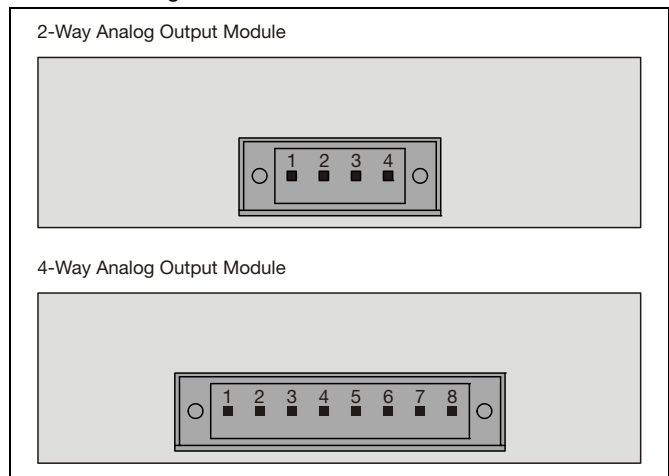
An analog output is allocated in the sequence of the sample components for each sample component. The sequence of the sample components is documented in the analyzer data sheet and on the type plate.

Electrical Connections

- 1 AO1+ } for 2-Way Analog Output Module and
- 2 AO1- } 4-Way Analog Output Module
- 3 AO2+ } for 2-Way Analog Output Module and
- 4 AO2- } 4-Way Analog Output Module
- 5 AO3+ } only for
- 6 AO3- } 4-Way Analog Output Module
- 7 AO4+ } for 2-Way Analog Output Module and
- 8 AO4- } 4-Way Analog Output Module

Design: 4-pin or 8-pin terminal strip. Observe the notes regarding I/O module connection (see page 17)!

Connection Diagrams



I/O Modules

Digital I/O Module

Digital Inputs (DI1 to DI4)

Optocouplers with internal 24 VDC power supply. Control with floating contacts, with external voltage 12–24 VDC or with open collector drivers PNP or NPN.

Digital Outputs (DO1 to DO4)

Floating double-throw contacts, max. contact load rating 30 VDC/1 A

Relays must at all times be operated within the specified data range. Inductive or capacitive loads are to be connected with suitable protective measures (self-induction recuperation diodes for inductive loads and series resistors for capacitive loads).

Terminal Assignment

Digital input and output signals	Standard assignment ¹⁾ Digital I/O Module	
	1	2
Error		
Maintenance request		
Maintenance mode		
Overall status	DO1	
Start automatic calibration	DI1	
Stop automatic calibration		
Disable automatic calibration	DI2	
Sample gas valve	DO4	
Zero gas valve		
Span gas valves 1–5		
Pump on/off ²⁾		
Limit 1	DO2	
Limit 2	DO3	
Limit 3		DO1
Limit 4		DO2
Limit 5		DO3
Limit 6		DO4
Limit 7		
Limit 8		
Limit 9		
Limit 10		
Measuring range switch-over		
Measuring range feedback		
Bus DI 1–8		
External failure ³⁾	DI3	
External maintenance request ³⁾	DI4	

- 1) factory-set, can be changed by on-site configuration
- 2) when a pump (integral gas feed) is installed
- 3) Multiple external status signals can be configured depending on the number of free digital inputs.

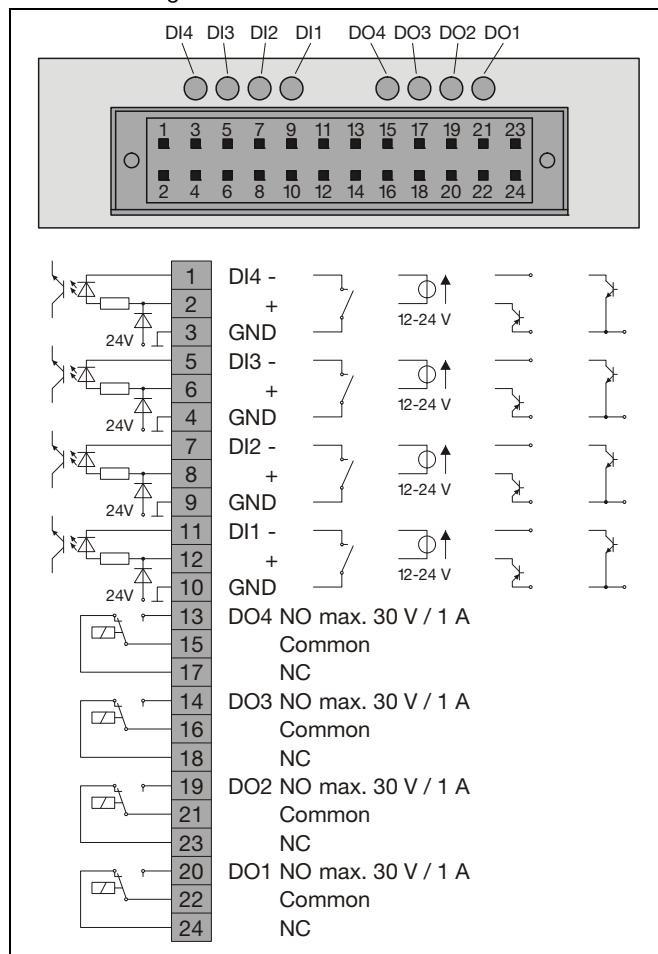
Electrical Connections

See connection diagram

Design: 2x12-pin terminal strip. Observe the notes regarding I/O module connection (see page 17)!

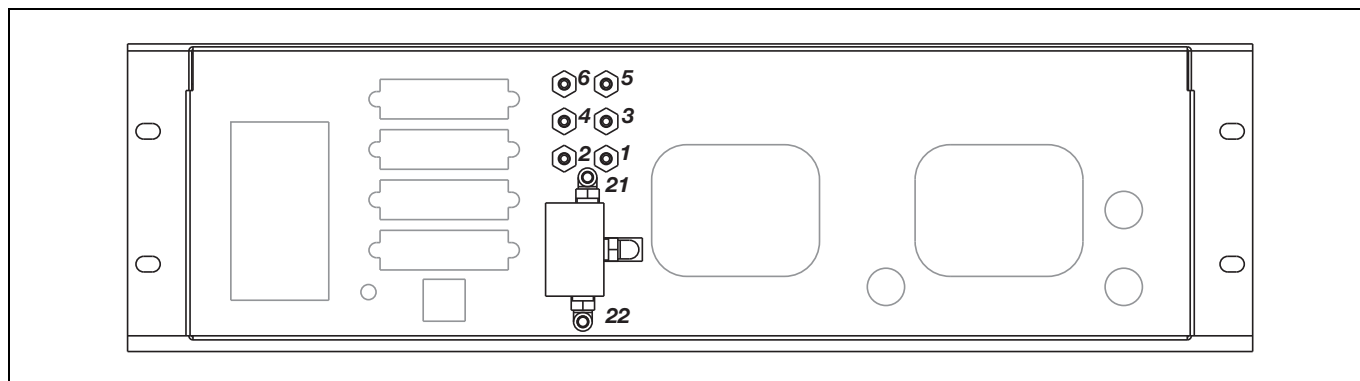
Relays are shown in the unpowered state. The unpowered state is the failure mode.

Connection Diagram



Gas Connections Uras26

Model EL3020 – Version with Gas Connections for Hoses (internal gas lines made up of hoses)

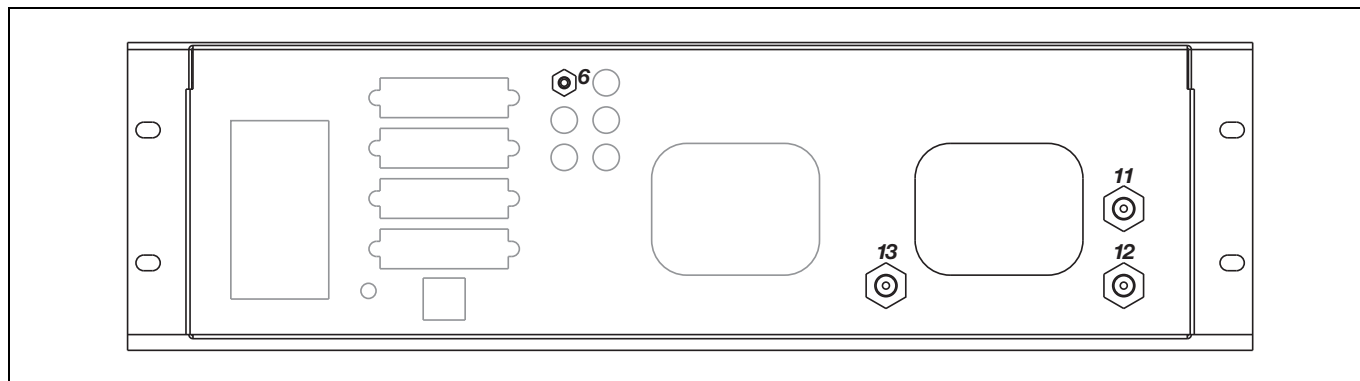


- 1** Sample Gas Inlet Gas Path 1 without “Integral Gas Feed” option
 - 2** Sample Gas Outlet Gas Path 1 connected to sample gas inlet of Caldos27 or Magnos206 if applicable
 - 3** Sample Gas Outlet for “Integral Gas Feed” option, factory-connected to Sample Gas Inlet gas Path 1
 - 4** Sample Gas Inlet for “Integral Gas Feed” option with flow sensor only (without solenoid valve)
 - 5** Sample Gas Inlet Gas Path 2
 - 6** Sample Gas Outlet Gas Path 2
 - 21** Sample Gas Inlet at solenoid valve
 - 22** Test Gas Inlet at solenoid valve
- } The version with two separate gas paths is used for NO_x measurement with a NO₂/NO converter connected upstream.
- } for “Integral Gas Feed” option with solenoid valve, pump, filter, capillary and flow sensor

Design: Hose nozzles (PVDF) for hoses with 4 mm inner diameter

Note: Pressure sensor (standard) and O₂ sensor (option) are connected internally as follows:
 downstream the sample cell 1 outlet for one sample cell or for two separate gas paths,
 downstream the sample cell 2 outlet for two sample cells in series.

Model EL3020 – Version with Gas Connections for Pipes (internal gas lines made up of stainless steel pipes)



- 6** Pressure Sensor

Design: Hose nozzle (PVDF) for hose with 4 mm inner diameter

- 11** Sample Gas Inlet
 - 12** Sample Gas Outlet for one sample cell
 - 13** Sample Gas Outlet for two sample cells in series
- } connected to sample gas inlet of Caldos27 or Magnos206 if applicable

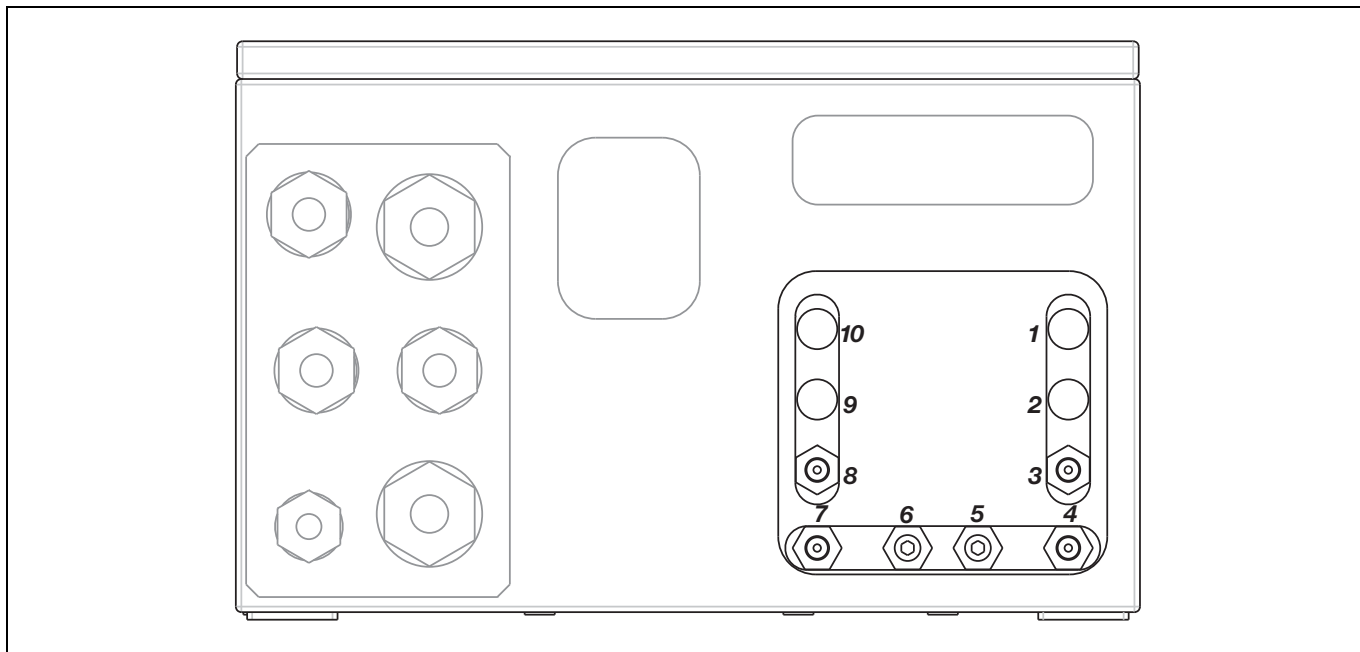
Design: 1/8 NPT female thread for threaded connections (not supplied)

Notes: This version is used when flammable components are present in the sample gas.

O₂ sensor, “Integral Gas Feed” option and version with two separate gas paths cannot be provided.

Gas Connections Uras26

Model EL3040



1 Gas Path (internal gas lines made up of hoses or stainless steel pipes)

- 1 not used
- 2 not used
- 3 Sample Gas Inlet
- 4 Sample Gas Outlet for one sample cell
- 5 Purge Gas Inlet Housing
- 6 Purge Gas Outlet Housing
- 7 not used
- 8 Sample Gas Outlet for two sample cells in series
- 9 Pressure Sensor (when internal gas paths are made up of stainless steel pipes)
- 10 not used

2 Separate Gas Paths (internal gas lines made up of hoses)

- 1 not used
- 2 not used
- 3 Sample Gas Inlet Gas Path 1
- 4 Sample Gas Outlet Gas Path 1
- 5 Purge Gas Inlet Housing
- 6 Purge Gas Outlet Housing
- 7 Sample Gas Inlet Gas Path 2
- 8 Sample Gas Outlet Gas Path 2
- 9 not used
- 10 not used

Design: 1/8 NPT female thread

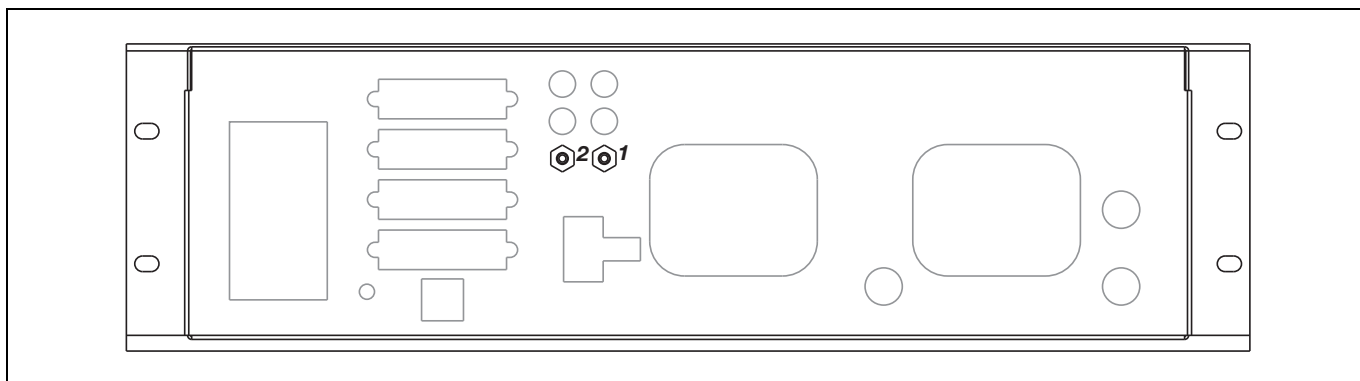
Notes: When the internal gas paths are made up of hoses, pressure sensor (standard) and O₂ sensor (option) are connected internally as follows:
downstream the sample cell 1 outlet for one sample cell or for two separate gas paths,
downstream the sample cell 2 outlet for two sample cells in series.

When the internal gas paths are made up of stainless steel pipes, O₂ sensor and version with two separate gas paths cannot be provided.

The version with two separate gas paths is used for NO_x measurement with a NO₂/NO converter connected upstream.

Gas Connections Limas23

Model EL3020

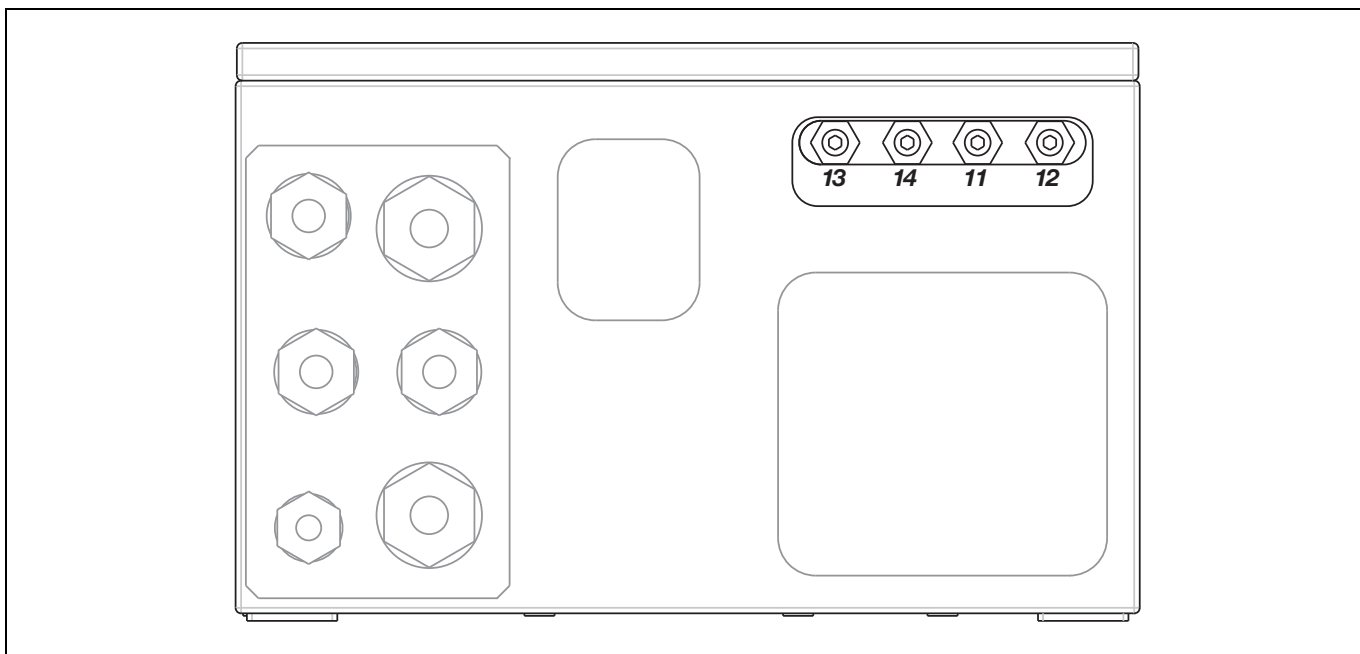


- 1** Sample Gas Inlet
- 2** Sample Gas Outlet (connected to sample gas inlet of Magnos206 if applicable)

Design: Hose nozzles (PVDF) for hoses with 4 mm inner diameter

Note: Pressure sensor (standard) and O₂ sensor (option) are connected internally downstream the sample cell.

Model EL3040



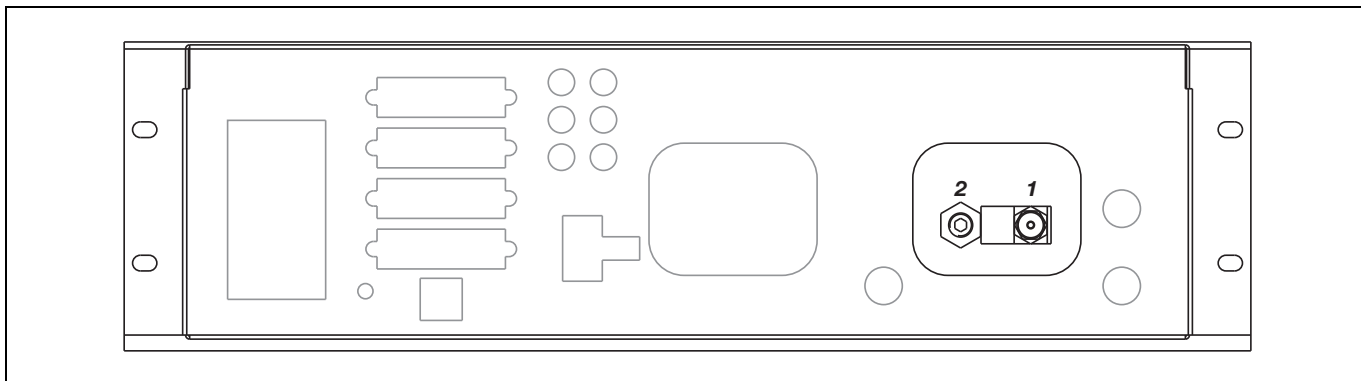
- 13** Sample Gas Inlet
- 14** Sample Gas Outlet (connected to sample gas inlet of Magnos206 if applicable)
- 11** Purge Gas Inlet Housing
- 12** Purge Gas Outlet Housing

Design: 1/8 NPT female thread

Note: Pressure sensor (standard) and O₂ sensor (option) are connected internally downstream the sample cell.

Gas Connections Z023

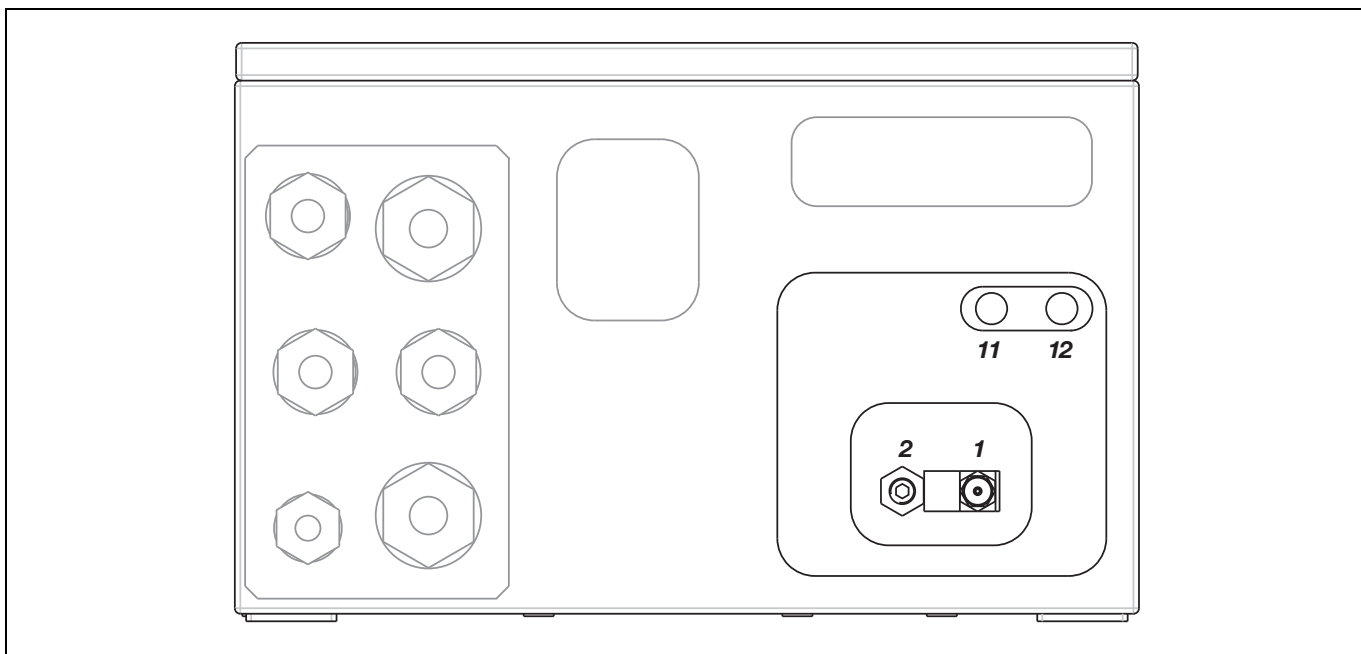
Model EL3020



- 1** Sample Gas Inlet
- 2** Sample Gas Outlet

Design: 1/8 NPT female thread (Sample gas inlet 3 mm Swagelok®)

Model EL3040

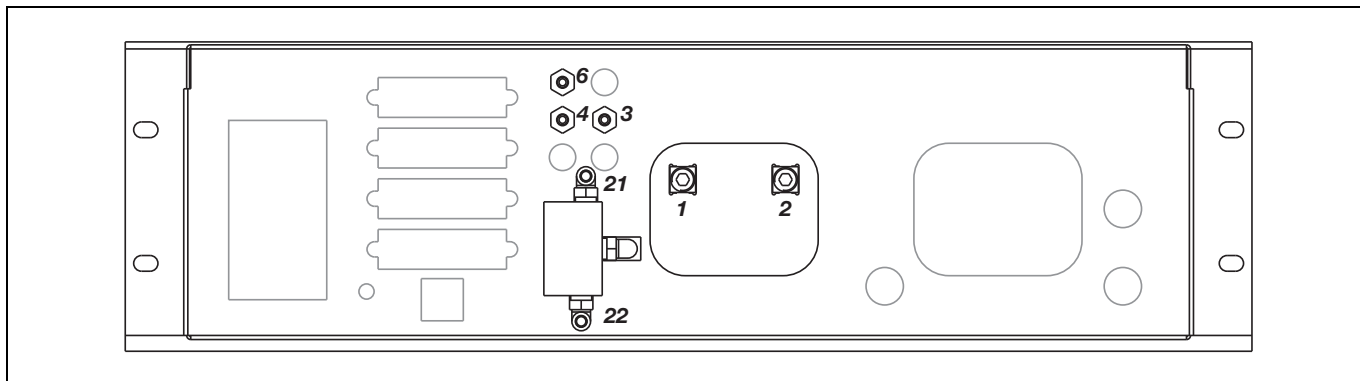


- 1** Sample Gas Inlet
- 2** Sample Gas Outlet
- 11** Purge Gas Inlet Housing
- 12** Purge Gas Outlet Housing

Design: 1/8 NPT female thread (Sample gas inlet 3 mm Swagelok®)

Gas Connections Magnos206

Model EL3020



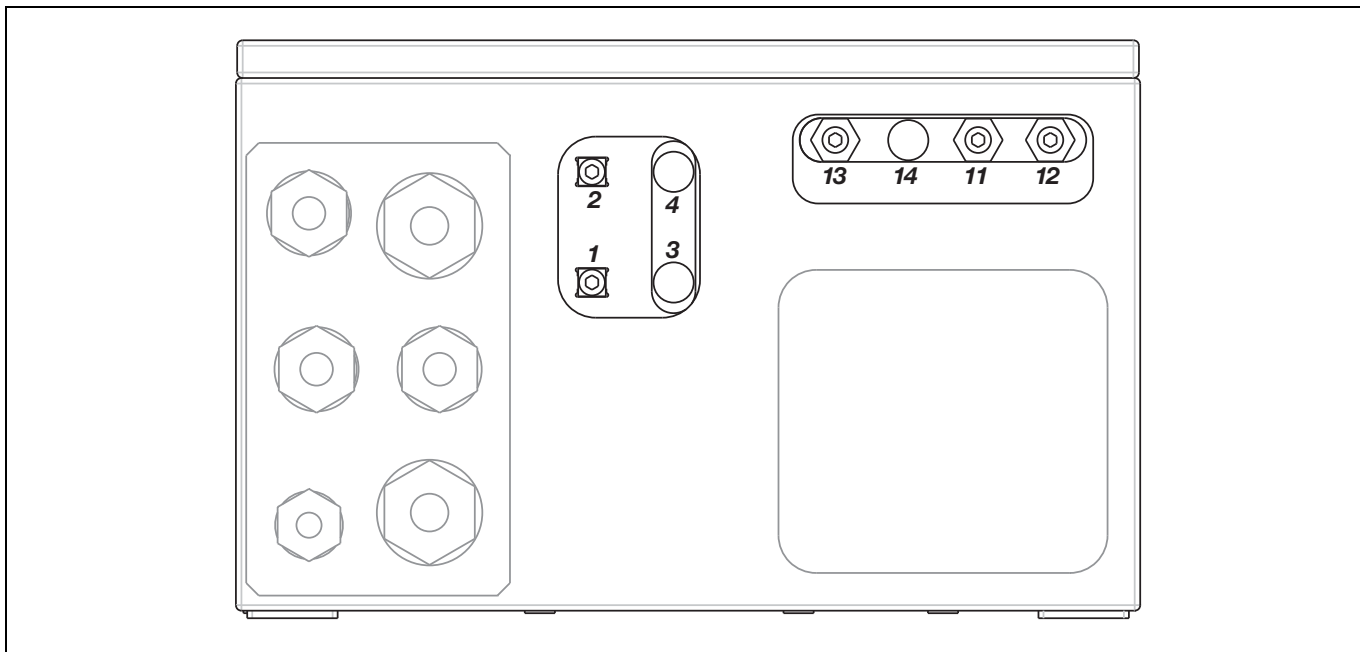
- 1** Sample Gas Inlet
- 2** Sample Gas Outlet

Design: 1/8 NPT female thread; connection of
 flexible tubes: 2 straight screwed fittings (PP) with nozzles for hoses with 4 mm inner diameter (supplied)
 pipelines: Threaded connections (not supplied)

- 3** Sample Gas Outlet for "Integral Gas Feed" option, factory-connected to **1** Sample Gas Inlet
- 4** Sample Gas Inlet for "Integral Gas Feed" option with flow sensor only (without solenoid valve)
- 6** Pressure Sensor Option
- 21** Sample Gas Inlet at solenoid valve } for "Integral Gas Feed" option with
- 22** Test Gas Inlet at solenoid valve } solenoid valve, pump, filter, capillary and flow sensor

Design: Hose nozzles (PVDF) for hoses with 4 mm inner diameter

Model EL3040

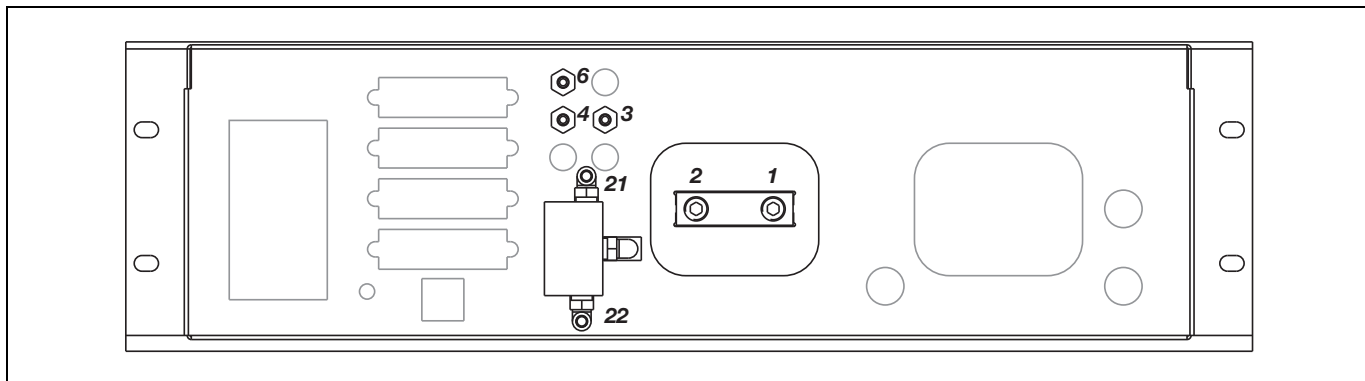


- 1** Sample Gas Inlet
- 2** Sample Gas Outlet
- 3** not used
- 4** not used
- 11** Purge Gas Inlet Housing
- 12** Purge Gas Outlet Housing
- 13** Pressure Sensor (Option)
- 14** not used

Design: 1/8 NPT female thread

Gas Connections Caldos27

Model EL3020



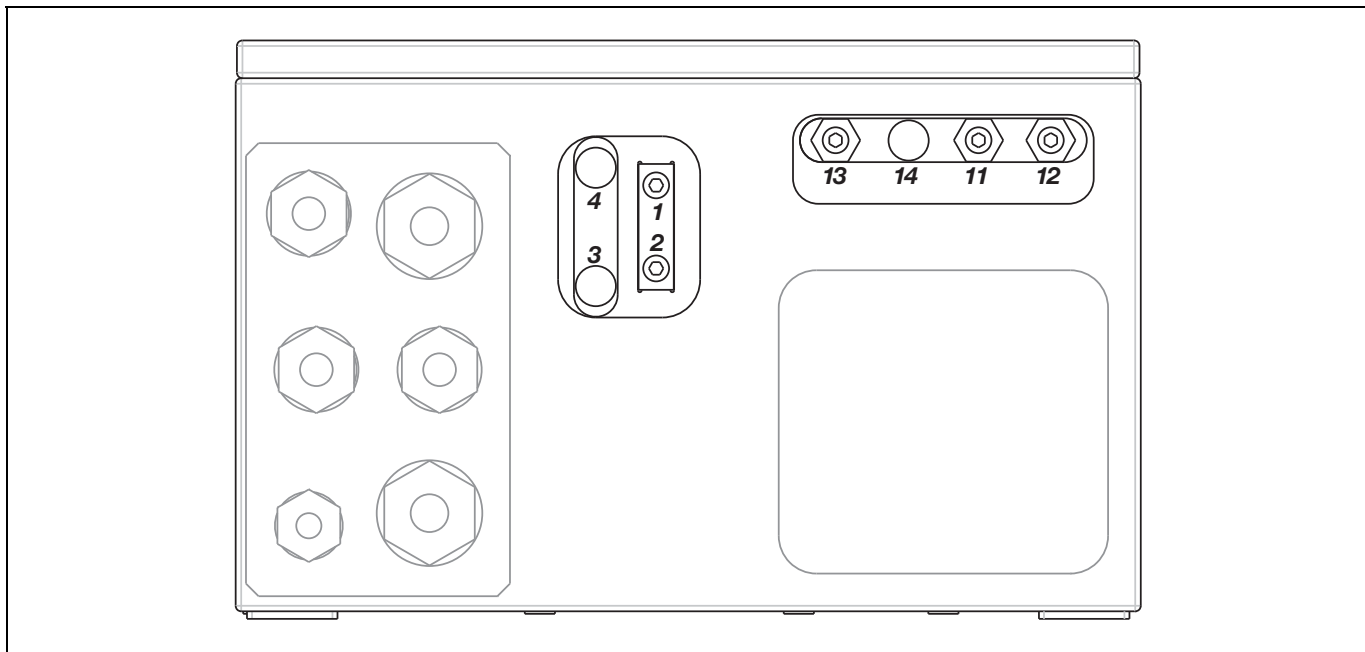
- 1** Sample Gas Inlet
- 2** Sample Gas Outlet

Design: 1/8 NPT female thread; connection of
 flexible tubes: 2 straight screwed fittings (PP) with nozzles for hoses with 4 mm inner diameter (supplied)
 pipelines: Threaded connections (not supplied)

- 3** Sample Gas Outlet for "Integral Gas Feed" option, factory-connected to **1** Sample Gas Inlet
- 4** Sample Gas Inlet for "Integral Gas Feed" option with flow sensor only (without solenoid valve)
- 6** Pressure Sensor
- 21** Sample Gas Inlet at solenoid valve } for "Integral Gas Feed" option with
- 22** Test Gas Inlet at solenoid valve } solenoid valve, pump, filter, capillary and flow sensor

Design: Hose nozzles (PVDF) for hoses with 4 mm inner diameter

Model EL3040

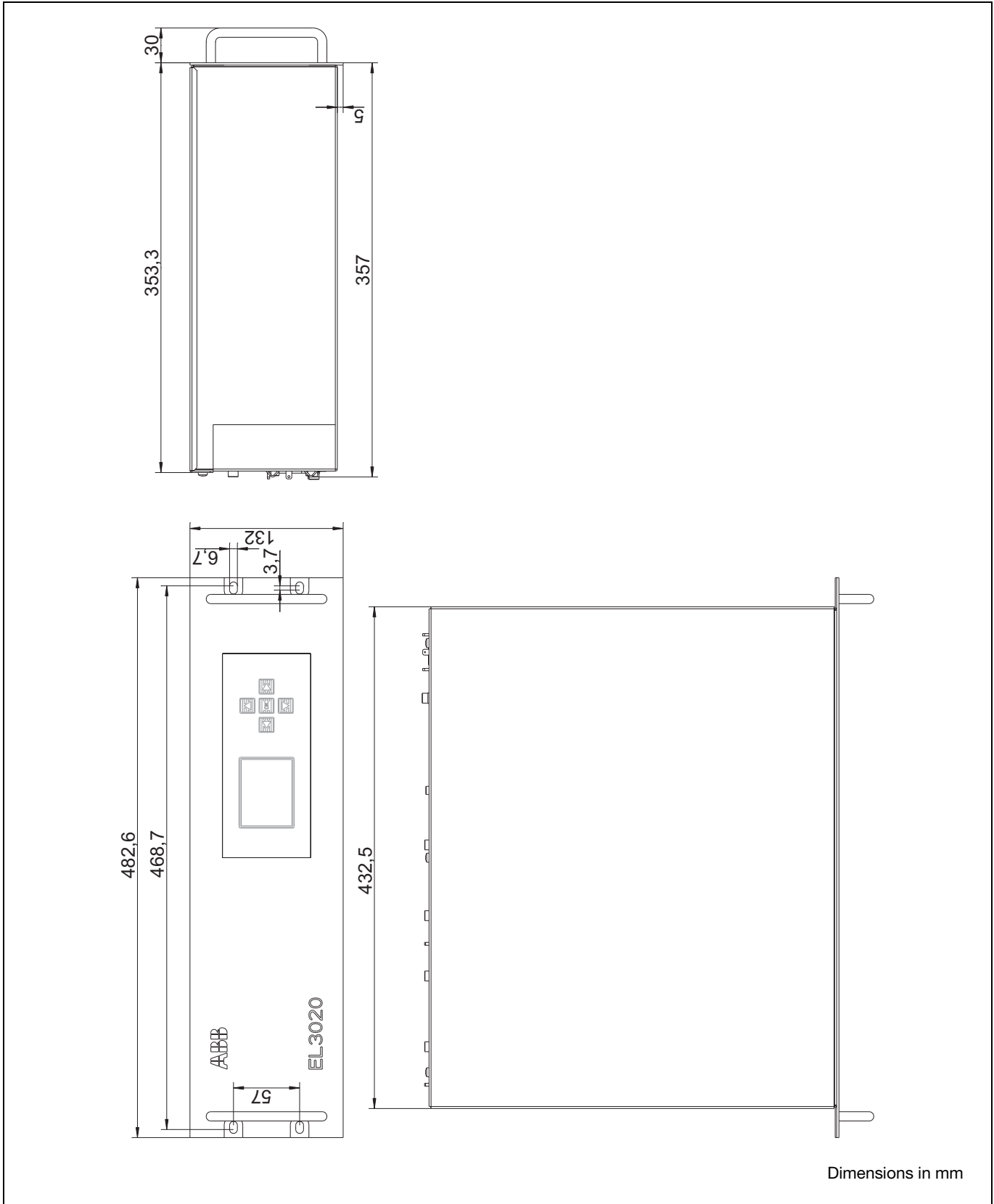


- 1** Sample Gas Inlet
- 2** Sample Gas Outlet
- 3** not used
- 4** not used
- 11** Purge Gas Inlet Housing
- 12** Purge Gas Outlet Housing
- 13** Pressure Sensor
- 14** not used

Design: 1/8 NPT female thread

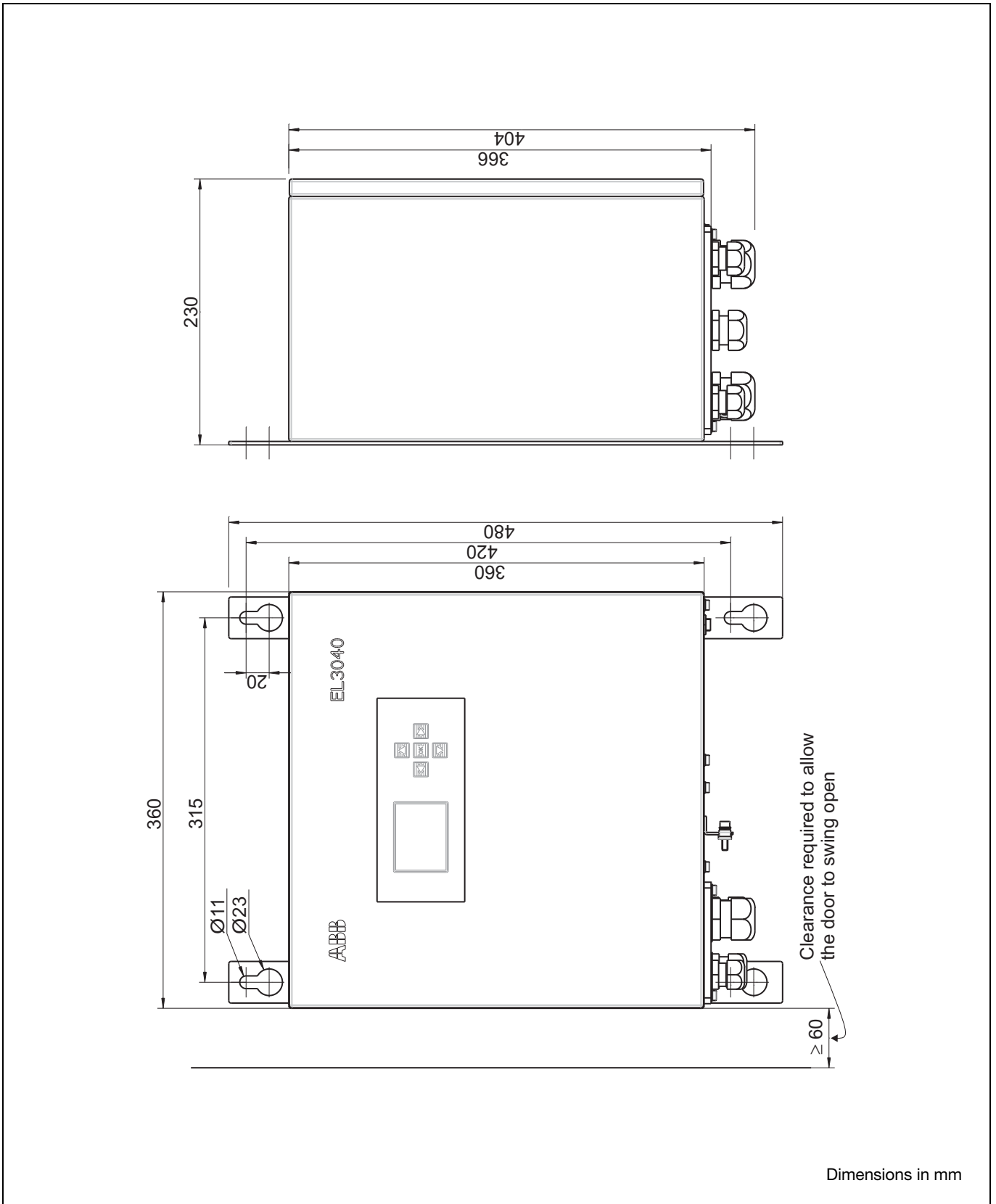
Dimensional Drawings

19-Inch Rack Housing (Model EL3020)



Dimensional Drawings

Wall-Mount Housing (Model EL3040)



Certifications

CE Declaration of Conformity

The EL3000 Series gas analyzers satisfy the requirements of the following European directives:

2006/95/EC Low Voltage Directive
2004/108/EC EMC Directive
94/9/EC ATEX Directive

Compliance with the requirements of directive 2006/95/EC is evidenced by full compliance with European standard:

EN 61010-1:2001

Compliance with the requirements of directive 2004/108/EC is evidenced by full compliance with European standards:

EN 61326-1:2006, EN 61000-3-2:2006 and EN 61000-3-3:1995 + A1:2001 + A2:2005

Compliance of the version in Category 3G for measurement of non-flammable gases and vapors with the requirements of directive 94/9/EC is evidenced by full compliance with European standard:

EN 60079-15:2005

Performance Test

The EL3000 Series gas analyzers

- Uras26 (sample components CO, NO, SO₂, CO₂, N₂O),
- Magnos206 (sample component O₂) and
- Electrochemical oxygen sensor (sample component O₂)

are certified according to the approval criteria of EN 15267 for use in facilities requiring authorization according to Directive 2001/80/EG and meet the requirements of the 27th/30th BImSchV (Federal Immissions Control Ordinance) and TA-Luft (Technical Instructions on Air Quality) regulations. The requirements based on QAL1 according to EN 14181 and EN ISO 14956 are fulfilled.

Report No. 691317 of June 30, 2006. Publication:
Federal Gazette of November 14, 2006, No. 194, Page 6715
Report No. 1243485a of February 14, 2009. Publication:
Federal Gazette of August 25, 2009, No. 125, Page 2936

Approval for USA and Canada – CSA

The EL3000 Series gas analyzers are certified for use in general purpose environment, evidenced by full compliance with standards CAN/CSA-C22.2 No. 61010-1-04 and UL 61010-1 (2nd Edition).

Certificate No. 1714030

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