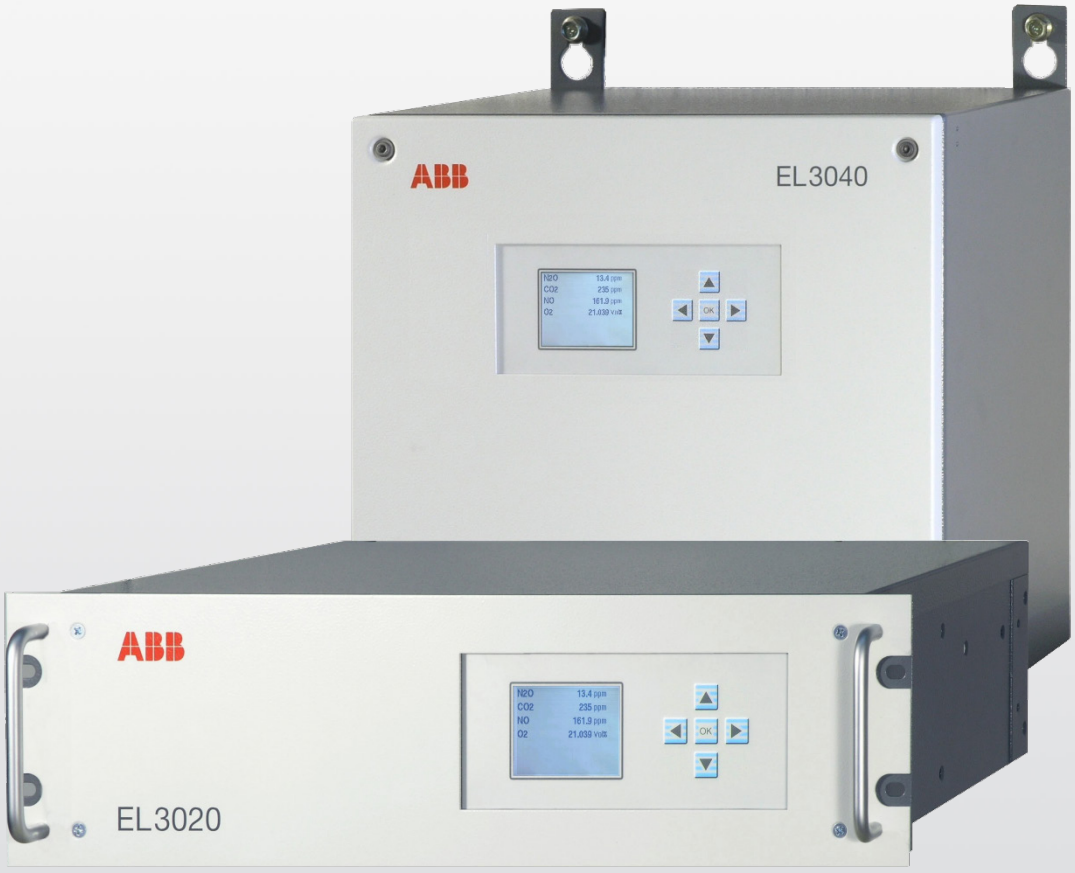
ABB MEASUREMENT & ANALYTICS | DATA SHEET

EasyLine EL3000

Continuous gas analyzers

ENGINEERED
TO OUTRUN



Measurement made easy

Intelligently simple, simply intelligent

A wide variety of measurement technology

- Detectors for multiple process and emission monitoring applications
- Up to five sample components per device
- Suited for measuring flammable gases
- Version in IP rating II 3G for measuring non-flammable gases
- Performance-tested for emission monitoring in accordance with EN 15267
- QAL3 monitoring in accordance with EN 14181 (optional)

Versatile, easy to use

- Automatic calibration including control of pump and valves
- Simplified calibration with air or integral calibration cells eliminating the need for test gas cylinders
- Self-monitoring function indicates when maintenance is required

Application-oriented design

- Housing design for 19” rack mounting or wall mounting
- Integrated gas feed as an option in model EL3020
- Ethernet, Modbus® and PROFIBUS® interfaces
- Configurable analog outputs and digital inputs and outputs

User-friendly operation

- Simple user interface
- Clear-text status messages
- Configuration of seldom required functions with configuration software

Overview

Measuring technology – Analyzers

The following analyzer modules are available for selection:

Analyzer module	Measuring task	Measurement-related data
Infrared photometer **Uras26**	Measurement of infrared-active gas components, such as CO, NO, SO_2	**Uras26 infrared photometer** from page 5 onwards
Ultraviolet photometer **Limas23**	Measurement of NO, NO_2 and SO_2.	**Ultraviolet photometer Limas23** from page 8 onwards
Oxygen analyzer **Magnos28**	Measurement of O_2 in operating gas or in N_2	**Oxygen analyzer Magnos28** from page 11 onwards
Oxygen analyzer **Magnos27**	Measurement of O_2 in flue gas or in N_2	**Oxygen analyzer Magnos27** from page 14 onwards
Trace oxygen analyzer **ZO23**	Measurement of O_2 in pure gases (N_2, CO_2, Ar)	**Trace oxygen analyzer ZO23** from page 16 onwards
Thermal conductivity analyzer **Caldos27**	Measurement of binary gas mixtures with different thermal conductivity, such as Ar in O_2, H_2 in Ar, CH_4 in N_2	**Thermal conductivity analyzer Caldos27** from page 19 onwards
Flame-ionization detector **Fidas24**	Measurement of hydrocarbons	**FID analyzer Fidas24** from page 22 onwards
Electrochemical oxygen sensor	Measurement of O_2	**Electrochemical oxygen sensor** from page 26 onwards

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.

Available analyzer combinations

Analyzer combination	EL3020	EL3040
Uras26 with Magnos28	•	•
Uras26 with Magnos27	•	—
Uras26 with Caldos27	•	•
Uras26 with oxygen sensor	•	•
Uras26 with 2× oxygen sensors	•	—
Limas23 with Magnos28	•	•
Limas23 with oxygen sensor	•	•
Magnos28 with Magnos28	•	•
Magnos28 with Caldos27	•	•
Caldos27 with Caldos27	•	•

Note
The Fidas24 and ZO23 analyzer modules cannot be combined with other analyzer modules.

… Overview

Calibration

Calibration can be performed automatically or manually or externally controlled via the Modbus®.

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 after all, the control of solenoid valves for switching on up to five end-point gases, zero point gas and sample gas via digital outputs can be configured.

Operating Concept

The operating concept of the gas analyzer provides for those functions that are required in normal operation to be operated and configured directly on the device.

On the other hand, the functions that are rarely needed, for example when commissioning the device, are configured offline using the ECT 'EasyLine Configuration Tool' software tool, also referred to as the 'configurator', and then loaded into the gas analyzer.

QAL3 monitoring

The gas analyzer can optionally be equipped with QAL3 monitoring, used to fulfill the requirements in accordance with EN 14181 for the 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 point and reference point.
- Reporting via CUSUM and Shewhart control charts
- Storage of QAL3 data in the gas analyzer (approx. 1 year)
- Display and query of QAL3 data as well as configuration (see) using a web browser
- Status messages in the case of deviations beyond requirements
- Data export for further processing, for example in a spreadsheet program.

Electrical interfaces

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

- the integrated Ethernet 10/100BASE-T interface for
  - device configuration with the ECT configurator,
  - transmission of data via Modbus® TCP/IP protocol (measured values, status signals, control signals)

  as well as the integrated I/O modules depending on the functional range and order
- PROFIBUS® module with one RS485 and one MBP interface (also in accordance with VDI 4201 Sheet 2),
- Modbus® module with one RS232 and one RS485 interface (also in accordance with VDI 4201 Sheet 3),
- Digital I/O module with four digital inputs and outputs each,
- 2-way analog output module with two analog outputs,
- 4-way analog output module with four analog outputs.

Integrated gas feed

The integral gas feed (optional in model EL3020) is available in two versions.
Depending on the version, the integrated gas extraction system consists of the following components:

- Version 1: Solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
- Version 2: Flow sensor.

Housing design

The housing for the EL3020 gas analyzer model is designed as a 19" housing with 3 HE and an IP rating of IP20.

Note regarding the analyzers performance characteristics

- The metrological data of the analyzers were determined according to IEC 61207-1:2010 "Expression of performance of gas analyzers – Part 1: General".
- The metrological data are based on operation at atmospheric pressure (1013 hPa) and nitrogen as the associated gas.
- Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.
- The physical detection limit is the lower limit of the measurement-related data relative to the measuring range span.

Uras26 infrared photometer

Measuring principle

Non-dispersive infrared absorption

Photometer with 1 or 2 beam paths (gas paths) to measure up to 4 sample components

Sample components and measurement ranges

Standard version

Sample components and smallest measuring ranges

Sample component	Smallest measurement range
CO	0 to 100 ppm
CO_2	0 to 100 ppm
NO	0 to 150 ppm
SO_2	0 to 100 ppm
N_2O	0 to 100 ppm
CH_4	0 to 100 ppm

Number of measuring ranges
2 measurement ranges

Measurement range limits

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

Note

- 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.
- Measuring ranges may not be specified within ignition limits.

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity error
≤ 1 % of span

Repeatability
≤ 0.5 % of span

Zero drift
≤ 1 % of span per week

Span drift
≤ 1 % of measured value per week

Output signal fluctuation (2 σ)
≤ 0.2 % of span at electronic T_{90} time (static/dynamic) = 5/0 sec

Detection limit (4 σ)
≤ 0.4 % of the measuring span at electronic T_{90} time (static/dynamic) = 5/0 sec

… Uras26 infrared photometer

Influences

Flow effect

Flow rate in the range 20 to 100 l/h:
Within the detection limit

Associated gas effect / Cross-sensitivity

Analyzer calibration should be based on an analysis of the sample gas.

At zero-point: Installation of interference filters or filter cells, internal electronic cross-sensitivity correction for a sample component by other sample components measured with the gas analyzer.

Temperature effect

Ambient temperature in permissible range.

- At zero point:
  ≤ 2 % of the span per 10 °C;
- On sensitivity without thermostat effect:
  ≤ 3 % of the measured value per 10 °C:
- On sensitivity with thermostat effect (option):
  ≤ 2 % of the measured value per 10 °C.

Thermostat temperature = 55 °C

Air pressure effect

- At zero point:
  No effect;
- On sensitivity with pressure correction using an integrated pressure sensor:
  ≤ 0.2 % of the measured value per 1 % air pressure change.

The pressure sensor is located in the sample gas path if hoses are used as the internal gas lines. If stainless steel pipes are used for internal gas lines, the pressure sensor is routed to the outside via a hose.

Power supply effect

Voltage and frequency in the permissible range:
No effect

Dynamic response

Warm-up time

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

T_{90}time

T_{90} ≤ 2.5 s for sample gas flow = 60 l/h and electronic T_{90} time (static/dynamic) = 5/0 s

Version for use in air separation units

Only for binary gas mixtures consisting of the sample component in Ar, N_2 or O_2

Sample component	Smallest/greatest measuring range
CO	0 to 10 ppm / 0 to 50 ppm
CO_2	0 to 5 ppm / 0 to 25 ppm
N_2O	0 to 10 ppm / 0 to 50 ppm
CH_4	0 to 20 ppm / 0 to 100 ppm

Other than the data valid for the standard version the following data apply for this version (in % of the smallest measurement range shown in the table):

Zero drift

≤ 1,5 % per day

Span drift

≤ 1 % per week

Output signal fluctuation (2 σ)

≤ 0.5 % with T_{90} = 15 s

Temperature effect

≤ 2 % per 10 °C

Calibration

Calibration	Test gas
Zero-point calibration	With inert gas, e.g. nitrogen, or with ambient air that is free of the sample component.
End-point calibration	With test gas or with calibration cells filled with gas (option). It is recommended to verify the calibration cell set values once a year.

Materials

Analyzer (sample cell)

- Tube: Aluminum
- Window: CaF_2 or BaF_2
- Connection socket: Stainless steel 1.4305 (AISI 316Ti)

Gas lines and connectors

- Gas lines: FPM tubing or PTFE pipes
- Gas connections:
  - Standard: Stainless steel 1.4305 (AISI 316Ti)
  - Solenoid valve (option EL3020): PVDF

Execution in the presence of flammable gas components in the sample gas:

- Gas lines: Stainless steel 1.4571 (AISI 316Ti)
- Gas connections: Stainless steel 1.4305 (AISI 316Ti)

Gas connections

See **Gas connections Uras26 (model EL3020)** on page 39 or **Gas connections Uras26 (model EL3040)** on page 41.

Sample gas conditions

Sample gas inlet conditions

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

Uras26 – sample gas input conditions	
Temperature	
If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement.	
Pressure	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h
Permissible absolute pressure range:	800 to 1250 hPa Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request
Gauge pressure in the sample cell:	max. 500 hPa
Flow rate	20 to 100 l/h

Corrosive gases

The analyzer may not be used for measurement in corrosive gases. Associated gases, such as chlorine (Cl_2) or hydrogen chlorides (such as wet HCl) as well as gases or aerosols containing chlorine must be cooled or pre-absorbed.

Flammable gases

In the version with gas lines and gas connectors made of stainless steel, the analyzer is suited for the measurement of flammable gases in non-explosive environments.

The notes on measuring flammable gases must be observed, see **Special conditions for the measurement of combustion gases** in the operating instructions.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Ultraviolet photometer Limas23

Measuring principle

UV-RAS method (UV Resonance Absorption Spectroscopy) for the sample component NO
NDUV method (Interference filter correlation) for the sample components NO_2 and SO_2

Photometer to measure up to 3 components

Sample components and measurement ranges

Sample component	Smallest measurement range	Largest range
NO	0 to 50 ppm	0 to 5000 ppm
NO_2	0 to 100 ppm	0 to 500 ppm
SO_2	0 to 100 ppm	0 to 5 vol.-%

The NO_x measured value can be calculated as the sum of the NO and NO_2 measured values and output. The NO_x measuring range results from the sum of the NO and NO_2 measuring 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 measured value in mg/m^3, the factor 1.53 is taken into account for conversion of NO to NO_x (factory-set).

Number of measuring ranges
2 measurement ranges

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

Smallest measurement range	Largest range
0 to 50 ppm	0 to 250 ppm
0 to 100 ppm	0 to 500 ppm
0 to 200 ppm	0 to 1000 ppm
0 to 400 ppm	0 to 2000 ppm
0 to 1000 ppm	0 to 5000 ppm
0 to 4000 ppm	0 to 20000 ppm
0 to 1 vol.%	0 to 5 vol.%

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

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity error
≤ 1 % of span

Repeatability
≤ 0.5 % of span

Zero drift
- For NO:
  ≤ 2 % of span per week
- For NO_2 and SO_2:
  - ≤ 3 ppm per week for measurement ranges
  - ≤ 100 ppm (daily automatic zero point check is recommended)
  - ≤ 2.5 % of the measuring span per week for measurement ranges > 100 ppm

Span drift
≤ 1 % of measured value per week

Output signal fluctuation (2 σ)
≤ 0.5 % of the measuring span at electronic T_{90} time = 20 s

Detection limit (4 σ)
≤ 1 % of the measuring span at electronic T_{90} time = 20 sec

Influences

Flow effect

Flow rate in the range 20 to 100 l/h:
Selectivity measures to reduce associated gas effect (optional):

Associated gas effect / Cross-sensitivity

Analyzer calibration should be based on an analysis of the sample gas.

At zero-point:
Internal adjustment or internal electronic cross-sensitivity correction of a sample component by other sample components measured with the gas analyzer.

Temperature effect

Ambient temperature in permissible range

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

Air pressure effect

- At zero point:
  No effect
- On sensitivity with pressure correction using an integrated pressure sensor:
  ≤ 0.2 % of the measured value per 1 % air pressure change

Power supply effect

Voltage and frequency in the permissible range:
No effect

Dynamic response

Warm-up time

Approx. 2 hours

T_{90}time

T_{90} ≤ 3 s at sample gas flow = 60 l/h and electronic T_{90}time = 0 s

Calibration

Zero-point calibration

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

End-point calibration

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

Materials

Analyzer (sample cell)

- Tube: Aluminum
- Window: CaF_2 or BaF_2
- Connection socket: Stainless steel 1.4305 (AISI 316Ti)

Gas lines and connectors

- Gas lines: FPM tubing or PTFE pipes
- Gas connections:
  - Standard: Stainless steel 1.4305 (AISI 316Ti)
  - Solenoid valve (option EL3020): PVDF

Execution in the presence of flammable gas components in the sample gas:

- Gas lines: Stainless steel 1.4571 (AISI 316Ti)
- Gas connections: Stainless steel 1.4305 (AISI 316Ti)

Gas connections

See **Gas connections Limas23 (model EL3020)** on page 50 or **Gas connections Limas23 (model EL3040)** on page 51.

Note

The analyzer cannot be used in combination with the integral gas feed.

… Ultraviolet photometer Limas23

Sample gas conditions

Sample gas inlet conditions

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

Limas23 – sample gas input conditions	
Temperature	
If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement.	
Pressure	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h
Permissible absolute pressure range:	800 to 1250 hPa Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request
Gauge pressure in the sample cell:	max. 500 hPa
Flow rate	20 to 100 l/h

Corrosive gases

The analyzer may not be used for measurement in corrosive gases. Associated gases, such as chlorine (Cl_2) or hydrogen chlorides (such as wet HCl) as well as gases or aerosols containing chlorine must be cooled or pre-absorbed.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Oxygen analyzer Magnos28

Measuring principle

Paramagnetic oxygen analyzer

Sample component and measuring ranges

Sample component	Smallest measurement range	Largest range
Oxygen (O_2)	0 to 0.5 vol.%	0 to 100 vol.%

Number of measuring ranges
There are two measuring ranges. The measuring range limits can be freely configured on the device.

The measuring range limits are set at the factory to 0 to 25 vol. % or 0 to 100 vol. % or in accordance with the order.

Note
Measurement ranges should not be set within ignition limits.

Measuring ranges with suppressed zero point
Suppressed measuring ranges can be freely adjusted in the range from 0 to 100 vol.-%. Multiple measuring ranges must be overlapping.
The minimum measuring span is 0.5 vol.-%.

For suppressed measuring ranges, pressure correction using a pressure sensor is required. If the analyzer has been ordered with the suppressed measuring range, a pressure sensor will be installed at the factory.

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity error
≤ 0.5 % of the measuring span or ≤ 0.005 vol.-% O_2, the greater value applies

Repeatability
≤ 50 ppm O_2

Zero drift
≤ 3 % of the span of the smallest measuring range (in accordance with the order) per week, or 0.05 vol.-% O_2 per week, whichever value is greater
The value may be elevated during first commissioning or after a longer service life.

Span drift
Drift per week: ≤ 0.2 % of the measured value or ≤ 0.01 vol. % O_2, the greater value applies

Output signal fluctuation (2 σ)
≤ 25 ppm O_2 at electronic T_{90} time (static/dynamic) = 3/0 sec

Detection limit (4 σ)
≤ 50 ppm O_2 at electronic T_{90} time (static/dynamic) = 3/0 sec

… Oxygen analyzer Magnos28

Influences

Flow effect

- Sample gas N_2:
  ≤ 0.1 vol.-% O_2 in the permissible flow range;
- Sample gas air:
  ≤ 0.1 vol.-% O_2 at a flow rate change of 10 l/h

Associated gas effect

Information on the influence of associated gases can be found in IEC 61207-3:2002 'Gas analyzers – Expression of performance – Part 3: Paramagnetic oxygen analyzers'.

Temperature effect

Average temperature effect in permissible ambient temperature range:

- At zero point:
  ≤ 0.02 vol. % O_2 per 10 °C
- On sensitivity:
  ≤ 0.3 % of the measured value per 10 °C
- For suppressed measuring ranges
  (if configured at the factory):
  ≤ 0.01 vol.-% per 10 °C in the entire measuring range

Thermostat temperature: 60 °C

For suppressed measuring ranges and very small measuring ranges (≤ 0 to 1 vol.-% O_2), greater temperature fluctuations (≥ 5 °C) at the installation site should be avoided.

Air pressure effect

- On sensitivity without pressure correction:
  ≤ 1 % of the measured value per 1 % air pressure change
- On sensitivity with pressure correction using an integrated pressure sensor (option):
  ≤ 0.1 % of the measured value per 1 % air pressure change
- For suppressed measuring ranges:
  ≤ 0.01 % of the measured value per 1 % air pressure change or ≤ 0.002 vol.-% O_2 per 1 % air pressure change,
  the greater value applies

Position effect

Zero point shift ≤ 0.05 vol.-% O_2 per 1° deviation from horizontal location.
Position has no effect on the hard-mounted unit.

Dynamic response

Warm-up time

The analyzer typically reaches the specified zero point drift per week after 2 h.
For measuring spans of < 0 to 5 % as well as on initial commissioning or after a longer service life, the value may be higher.

T_{90}time

T_{90} ≤ 3 sec at a sample gas flow of 90 l/h and electronic T_{90} time (static/dynamic) = 3/0 sec, gas change from nitrogen to air (applies to a gas analyzer only with Magnos28)

Calibration

Calibration	Test gas
Zero-point calibration	Oxygen-free operating gas or with substitute gas
End-point calibration	Operating gas with a known oxygen concentration or a substitute gas such as dried air.
Single-point calibration	• Zero point calibration with known oxygen concentration, e.g. with diluted nitrogen or ambient air, processed through a cooler or H_2O absorber. • Pressure correction using a pressure sensor is recommended for single-point calibration with air. • Depending on the measurement task involved, the zero point and end point should be verified periodically (recommendation: once a year).
Measurement ranges with suppressed zero point	Suppressed measuring ranges should be calibrated for the greatest possible accuracy with high-accuracy purity gases or test gases. For calibration recommendation see the following table.

Calibration recommendation for suppressed measuring ranges

Upper range value	Zero gas point	End point gas
Up to 100 vol.-% O_2	N_2	100 % O_2
Up to about 21 vol.-% O_2	N_2	Instrument air or high-purity test gas

Materials

Analyzer

- Sample chamber: • Stainless steel 1.4305, nickel alloy, glass, PtNi, silicon, gold, PTFE
- Gaskets: FPM, option: FFKM75

Gas connections

- Solenoid valve (option in model EL3020) PVDF

Gas connections

See **Gas connections Magnos28 (model EL3020)** on page 55 or **Gas connections Magnos28 (model EL3040)** on page 59.

Sample gas conditions

Sample gas inlet conditions

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

Magnos28 – sample gas input conditions	
Temperature	
• If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement. • When there is a direct connection to the sample chamber, the maximum sample gas dew point is 55 °C. • Water vapor content variations cause volume errors.	
Designation of gas connections	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h
Permissible absolute pressure range:	800 to 1600 hPa Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request
Operation under higher pressure:	A pressure sensor is required to compensate for pressure influences.
Absolute pressure ≤ 1250 hPa:	An optional internal pressure sensor can be connected to the sample gas path.
Absolute pressure ≥ 1250 hPa:	An external pressure sensor must be connected to the sample gas path. The pressure compensation must be calculated externally.
The analyzer module is function-tested for 5000 hPa internal pressure without damage.	
Flow rate	30 to 90 l/h Measuring ranges ≤ 0 to 3 vol % O_2: 60l/h For highly suppressed measuring ranges and measuring ranges of ≤ 0 to 3 vol % O_2, changes of the sample gas flow should be avoided.

Corrosive gases

If the sample gas contains Cl_2, HCl, HF or other corrosive components, the analyzer may only be used if the sample gas composition has been taken into account by the manufacturer for the configuration of the analyzer. If the sample gas contains NH_3, FFKM75 gaskets must be used; in this case, the integral gas feed cannot be connected to the analyzer. The pressure sensor must not be connected to the sample gas path.

Flammable gases

The analyzer is suited for measuring flammable gases in a non-explosive environment.

The notes on measuring flammable gases must be observed, see **Special conditions for the measurement of combustion gases** in the operating instructions.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Oxygen analyzer Magnos27

Measuring principle

Paramagnetic behavior of oxygen
Heavy-duty thermomagnetic analyzer

Sample component and measuring ranges

Sample component	Smallest measuring range	Largest measuring range
Oxygen (O_2) in flue gas or in nitrogen (N_2)	0 to 10 vol.%	0 to 100 vol.%

Number of measuring ranges
There are two measuring ranges. The measuring ranges are factory-set.

Note
Measurement ranges within ignition limits cannot be provided.

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity error
≤ 2 % of span

Repeatability
≤ 1 % of measuring span

Zero point drift
≤ 1 % of span per week

Span drift
≤ 2 % of measured value per week

Output signal fluctuation (2 σ)
≤ 0.5 % of smallest measuring range span at electronic T_{90} time = 0 s

Detection limit (4 σ)
≤ 1 % of the measuring span of the smallest measuring range at electronic T_{90} time = 0 s

Influences

Flow effect
≤ 1 % 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
Magnos27 calibration applies only to the sample gas shown on the identification plate (= sample component + associated gas).

Temperature effect
Ambient temperature in permissible range
- At zero point:
  ≤ 2 % of span per 10 °C
- On the sensitivity:
  ≤ 0.5 % of the measured value per 10 °C

based on temperature at the time of calibration
Thermostat temperature = 63 °C.

Air pressure effect
- at zero point:
  < 0.05 vol. % O_2 per 1 % air pressure
- On sensitivity without pressure correction:
  ≤ 1.5 % of the measured value per 1 % of air pressure change
- On sensitivity with pressure correction using an integrated pressure sensor (option):
  ≤ 0.25 % of the measured value per 1 % of air pressure change

Option: calibration for operating altitude over 2000 m

Power supply effect
DC 24 V ± 5 %: ≤ 0.2 % of span

Position effect
Approx. 3 % of the span of the smallest measuring range per 1° deviation from horizontal orientation.
Position has no effect on the hard-mounted unit.

Dynamic response

Warm-up time

2 to 4 h

T_{90} time

T_{90}= 10 to 22 s, depending on sample gas flow and on the sample chamber connection (see **Magnos27: Gas connections** on page 60; applies to a gas analyzer only with Magnos27)

Calibration

Zero-point calibration

With oxygen-free process gas or substitute gas

End-point calibration

With process gas having a known oxygen concentration or with substitute gas

Materials

Note

The analyzer can only be mounted in the 19" housing (model EL3020). The analyzer cannot be used in combination with the integral gas feed.

Analyzer

Stainless steel 1.4580 and 1.4305, glass

Gas lines and connectors

Stainless steel 1.4571 and 1.4305, PVC-C, FPM

Gas connections

Refer to **Magnos27: Gas connections** on page 60

Sample gas conditions

Sample gas inlet conditions

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

Magnos27 – sample gas input conditions

Temperature

- If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement.
- When there is a direct connection to the sample chamber, the maximum sample gas dew point is 55 °C.
- Water vapor content variations cause volume errors.

Designation of gas connections	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h.
Permissible absolute pressure range:	800 to 1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request.
Gauge pressure in the measuring chamber:	max. 100 hPa.
Flow rate	20 to 90 l/h

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Trace oxygen analyzer ZO23

Measuring principle

Potentiometric measurement

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

The analyzer module is used for the continuous measurement of oxygen in pure gases (N_2, CO_2, 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 measuring ranges

Sample component

Oxygen (O_2)

Number of measuring ranges

There are two measuring ranges. The measuring range limits can be freely set from 0 to 1 ppm and from 0 bis 250.000 ppm O_2.

The following measurement data refer to a span of 100 ppm O_2 with a regulated flow rate of 8 ±0.2 l/h.

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity

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

Repeatability

< 1 % of the measuring span or 100 ppb O_2 (greater value applies)

Zero point drift

< 1 % of the measuring range per week or 250 ppb O_2 (greater value applies)

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. % O_2 (at 25 °C and 50 % relative air humidity) may deviate through aging of the cell.

Span drift

For pure gas measurements in N_2, CO_2 and Ar:
< 1 % of the measuring range per week or 250 ppb O_2 (greater value applies)

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

Output signal fluctuation (2 σ)

< ±0.5 % of the measured value or 50 ppb O_2 (whichever is greater)

Detection limit (4 σ)

< ±1 % of the measured value or 100 ppb O_2 (whichever is greater)

Influences

Flow effect

≤ 300 ppbv O_2 in the range from 5 to 10 l/h

Associated gas effect

Inert gases (Ar, CO_2, N_2) have no effect.
Flammable gases (CO, H_2, CH_4) in stoichiometric concentrations to the oxygen content:
Conversion O_2 < 20 % of the stoichiometric turnover.
If higher concentrations of flammable gases are present, higher O_2 conversions must be expected. The sum of concentrations 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 O_2 per 10 °C change in the ambient temperature, whichever value 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

DC 24 V ± 5 %: no effect

Position effect

No position effect for permanently installed instruments

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.

T_{90}time

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

Calibration

Offset calibration

The reference value for ambient air is calibrated at 20.6 vol.% O_2 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 Ar);
O_2 concentration in the measuring range, e.g. 10 ppm O_2

Function test

Extended response time or reduced sensitivity are dimensions for the correct functioning of the measuring cell. The function test can be carried out without any additional test gases by feeding the sample gas with constant concentration.

Based on 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 minutes.

Materials

Note

The analyzer cannot be used in combination with the integral gas feed.

Analyzer

- Zirconium dioxide cell: ZrO_2, electrodes containing platinum
- Dust filter (optional): PP
- Flow sensor (optional): on semiconductor basis, nickel-plated brass

Gas lines and connectors

- Gas inlet (piped): Stainless steel 1.4571 (AISI 316Ti)
- Gas outlet: Silicone hose and FPM-hose
- Gas connections: Stainless steel 1.4401/1.4305

Gas connections

See **Gas connections ZO23 (model EL3020)** on page 62 or **Gas connections ZO23 (model EL3040)** on page 63.

… Trace oxygen analyzer ZO23

Sample gas conditions

Sample gas inlet conditions

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

ZO23 – sample gas input conditions	
Temperature	5 to 50 °C
Inlet pressure	$p_e \leq 70$ hPa
Flow rate	4 to 20 l/h Adjustment via fine dosing valve

Corrosive gases

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

Flammable gases

The analyzer module is suitable for measuring flammable gases in a non-explosive environment. The concentration of flammable gases in the sample gas must not exceed 100 ppm.

Purge gas

If housing purge (only in model EL3040) is selected, purging may only be carried out with air (not with nitrogen), since the ambient air is used as a reference gas.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Thermal conductivity analyzer Caldos27

Measuring principle

Difference in thermal conductivity of various gases

Micromechanical silicon sensor with especially short T_{90} time

Sample components and measurement ranges

Sample component and associated gas	Smallest measuring range	Smallest measurement range with suppressed zero-point
Ar in CO_2	—	50 to 100 Vol.-%
Ar in H_2	0 to 3 Vol.-%	99 to 100 Vol.-%
Ar in He	0 to 3 Vol.-%	99 to 100 Vol.-%
Ar in air	0 to 6 Vol.-%	94 to 100 Vol.-%
Ar in N_2	0 to 6 Vol.-%	94 to 100 Vol.-%
Ar in O_2	0 to 10 Vol.-%	90 to 100 Vol.-%
CH_4 in H_2	0 to 3 Vol.-%	99 to 100 Vol.-%
CH_4 in N_2	0 to 6 Vol.-%	94 to 100 Vol.-%
CO in H_2	0 to 3 Vol.-%	99 to 100 Vol.-%
CO_2in Ar	0 to 50 Vol.-%	—
CO_2 in H_2	0 to 3 Vol.-%	99 to 100 Vol.-%
CO_2 in air	0 to 10 Vol.-%	90 to 100 Vol.-%
CO_2 in N_2	0 to 10 Vol.-%	90 to 100 Vol.-%
H_2 in Ar	0 to 1 Vol.-%	97 to 100 Vol.-%
H_2 in CH_4	0 to 1 Vol.-%	97 to 100 Vol.-%
H_2 in CO	0 to 1 Vol.-%	97 to 100 Vol.-%
H_2 in CO_2	0 to 1 Vol.-%	97 to 100 Vol.-%
H_2 in air	0 to 1 Vol.-%	—
H_2 in N_2	0 to 1 Vol.-%	97 to 100 Vol.-%
H_2 in NH_3	0 to 10 Vol.-%	90 to 100 Vol.-%
H_2 in O_2	0 to 1 Vol.-%	98 to 100 Vol.-%
He in Ar	0 to 1 Vol.-%	97 to 100 Vol.-%
He in air	0 to 2 Vol.-%	97 to 100 Vol.-%
He in N_2	0 to 2 Vol.-%	97 to 100 Vol.-%
Air in Ar	0 to 6 Vol.-%	94 to 100 Vol.-%
Air in CO_2	0 to 10 Vol.-%	90 to 100 Vol.-%
Air in H_2	0 to 3 Vol.-%	—
Ar in He	0 to 3 Vol.-%	98 to 100 Vol.-%
N_2 in Ar	0 to 6 Vol.-%	94 to 100 Vol.-%
N_2 in CH_4	0 to 6 Vol.-%	94 to 100 Vol.-%
N_2 in CO_2	0 to 10 Vol.-%	90 to 100 Vol.-%
N_2 in H_2	0 to 3 Vol.-%	99 to 100 Vol.-%
N_2 in He	0 to 3 Vol.-%	98 to 100 Vol.-%
NH_3 in H_2	0 to 10 Vol.-%	90 to 100 Vol.-%
O_2 in Ar	0 to 10 Vol.-%	90 to 100 Vol.-%

Sample components and measurement ranges for monitoring hydrogen-cooled turbo generators

Sample component and associated gas	Meas. range
CO_2 in air	0 to 100 Vol.-%
Ar in air	0 to 100 Vol.-%
H_2 in CO_2	100 to 0 Vol.-%
H_2 in Ar	100 to 0 Vol.-%
H_2 in air	100 to 80 Vol.-%

Note

Other sample components on request.

Measuring range quantity and measuring range limits

There are 2 available measuring ranges.
Measurement ranges are freely adjustable within the limits shown in the table.

Largest measuring range

0 to 100 vol.% or 0 vol.-% to saturation, depending on measurement task.
Measurement ranges should not be set within ignition limits.

… Thermal conductivity analyzer Caldos27

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. The data is based on the smallest measuring ranges given in the table; the deviations may be larger for smaller measurement ranges.

Linearity error

≤ 2 % of span

Repeatability

≤ 1 % of span

Zero drift

≤ 2 % of smallest possible measuring range per week

Span drift

≤ 0.5 % of the smallest provided measuring range per week

Output signal fluctuation (2 σ)

≤ 0.5 % of smallest measurement range span at electronic T_{90} time = 3 sec

Detection limit (4 σ)

≤ 1 % of smallest measurement range span at electronic T_{90} time = 3 sec

Influences

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

Analyzer calibration should be based on an analysis of the sample gas.

Temperature effect

Ambient temperature in permissible range.
At each point in the measuring range:
≤ 0.5 % of the measuring span per 10 °C, with respect to the temperature during calibration
Thermostat temperature = 60 °C (140 °F)

Air pressure effect

≤ 0.25 % of span per 10 hPa for the smallest ranges; for larger spans, the influence effect is correspondingly lower.
Power Supply Influence Calibration for operating altitude over 2000 m

Power supply effect

24 V DC ± 5 %: ≤ 0.2 % of span

Position effect

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

Dynamic response

Warm-up time

Approx. 30 minutes

T_{90}time

$T_{90} \leq 2$ s at sample gas flow = 60 l/h

Calibration

Calibration	Test gas
Zero-point calibration	Sample-component-free process gas or substitute gas
End-point calibration	Test gas, process gas with a known sample gas concentration or substitute gas
Single-point calibration with standard gas	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.

Note

Depending on the measurement task involved, the zero point and end point should be verified periodically (recommendation: once a year).

Materials of the wetted parts

Analyzer

- Sample chamber: Stainless steel 1.4305 (AISI 316Ti)
- Sensor: Gold, silicon oxi-nitride
- Gasket: FFKM75 (Perfluoro rubber)

Gas connections

See **Gas connections Caldos27 (model EL3020)** on page 64 or **Gas connections Caldos27 (model EL3040)** on page 66.

Sample gas conditions

Sample gas inlet conditions

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

Caldos27 – sample gas input conditions	
Temperature	
• If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement. • Water vapor content variations cause volume errors	
Designation of gas connections	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h.
Permissible absolute pressure range:	800 to 1250 hPa Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request
Gauge pressure in the measuring chamber:	max. 100 hPa
Flow rate	Typically 10 to 90 l/h, minimum 1 l/h

Corrosive gases

If the sample gas contains Cl_2, HCl, HF, SO_2, NH_3, H_2S or other corrosive components, the analyzer may only be used if the sample gas composition has been taken into account by the manufacturer for the configuration of the analyzer.

Flammable gases

The analyzer is suited for measuring flammable gases in a non-explosive environment.

The notes on measuring flammable gases must be observed, see **Special conditions for the measurement of combustion gases** in the operating instructions.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

FID analyzer Fidas24

Measuring principle

Flame-ionization detector

The analyzer module complies with the requirements for measuring instruments with flame ionization detection according to EN 12619.

Sample components and measurement ranges

Sample component	Smallest measurement range	Largest range
Hydrocarbons (THC)	0 to 5 to 0 to 1500 mg org. C/m³	0 to 18 to 0 to 5000 mg org. C/m³
	or	or
	0 to 10 to 0 to 3000 ppm C1	0 to 35 to 0 to 10000 ppm C1

Note

The sample component concentration in the sample gas should not exceed 100 % of the LEL.

Number of sample components

One measuring component

Number of measuring ranges

2 measurement ranges

Measurement range limits

The measurement range limits can be freely set in the ranges specified above.

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

They apply to measuring ranges ≥ 50 mg org. C/m³; for smaller measuring ranges these only apply if they are factory-set in accordance with the order.

Linearity error

≤ 2 % of span to 5000 mg org. C/m³,
this value applies in one (calibrated) measuring range

Repeatability

≤ 0.5 % of measurement range

Zero drift

≤ 0.5 mg org. C/m³ per week

Span drift

≤ 0.5 mg org. C/m³ per week

Output signal fluctuation (2 σ)

≤ 0.5 % of span at electronic T_{90}time = 20 sec, not smaller than 10 µg org. C/m³

Detection limit (4 σ)

≤ 1 % of span at electronic T_{90}time = 20 sec, not smaller than 20 µg org. C/m³

Influences

Oxygen dependence

≤ 2 % of measured value for 0 to 21 vol. % O_2 or
≤ 0.3 mg org. C/m^3, the larger value applies in each case

Temperature effect

Ambient temperature in permissible range

- At zero point and on sensitivity:
  ≤ 2 % of the measured value per 10 °C or ≤ 300 ppb C1 per 10 °C

Power supply effect

- DC 24 V ± 5 %: ≤ 0.2 % of span or
- AC 230 V ± 10 %: ≤ 0.2 % of span or
- AC 115 V ± 10 %: ≤ 0.2 % of span

Dynamic response

Warm-up time

≤ 2 hours

T_{90}time

T_{90} < 1.5 s at sample gas flow = 80 l/h and electronic T_{90}time = 1 sec

Calibration

Calibration	Test gas
Zero-point calibration	With synthetic air or catalytically purified air or nitrogen, depending on the application.
End-point calibration	With propane or another hydrocarbon (substitute gas) in air or nitrogen, depending on the application.

Materials

Analyzer, gas lines and connectors

Stainless steel 1.4305 and 1.4571, FPM, PTFE, FFKM

Gas connections

See **Gas connections and electrical connections Fidas24 (model EL3020)** on page 67 or **Gas connections and electrical connections Fidas24 (model EL3040)** on page 68.

Operating gases and test gases

Instrument air

Parameter	Value/Description
Quality	According to ISO 8573-1 Class 2 Particle size: max. 1 µm, Particle density: max. 1 mg/m^3, Oil content: max. 0.1 mg/m^3, Dew point: At least 10 °C below the lowest expected ambient temperature
Inlet pressure p_e	4000 hPa, ±500 hPa
Flow rate	Typically approx. 1800 l/h (1200 l/h for the air jet injector and approx. 600 l/h for the housing purge), max. approx. 2200 l/h (1500 l/h + 700 l/h)

Combustion gas

Note

An H_2/He mixture may only be used if the gas analyzer has been ordered and delivered in the intended version.

Combustion gas parameter		
Quality	Hydrogen (H_2), Quality 5.0	H_2/He mix (40 %/60 %) Quality 5.0
Inlet pressure p_e	1200 hPa, ±100 hPa	1200 hPa, ±100 hPa
Maximum combustion gas flow	approx. 3 l/h	approx. 10 l/h

Note

A flow limiter must be provided on the hydrogen supply, see **Safe operation of the gas analyzer** on page 25.

… FID analyzer Fidas24

… Operating gases and test gases

Combustion air

Parameter	Value/Description
Quality	• Synthetic air or catalytically purified air • Organic hydrocarbon content: < 1 % of the measuring range
Inlet pressure p_e	1200 hPa, ±100 hPa
Flow rate	< 20 l/h

Test gases

Test Gases for Zero Calibration	
Quality	• Nitrogen, quality 5.0; synthetic or catalytically purified air • Organic hydrocarbon content of < 1 % of the measuring range
Inlet pressure p_e	1000 ± 100 hPa
Flow rate	130 to 250 l/h

Test gases for endpoint calibration	
Quality	Sample component or substitute gas component in nitrogen or synthetic air with concentration adjusted to the measuring range
Inlet pressure p_e	1000 ±100 hPa
Flow rate	130 to 250 l/h

Sample gas conditions

Sample gas inlet conditions

Fidas24 – sample gas input conditions	
Temperature	≤ Thermostat temperature (thermostat temperature for sample gas path, detector and air injector ≤ 200 °C, factory-set at180 °C)
Inlet pressure	p_{abs} = 800 to 1100 hPa
Flow rate	approx. 80 to 100 l/h at atmospheric pressure (1000 hPa)
Humidity	≤ 40 % H_2O

Further properties of the sample gas

The sample gas must not be explosive at any time.

The analyzer module must not be used for the measurement of gases containing organometallic compounds, e.g. lead-containing fuel additives or silicone oils.

Flammable gases

The gas analyzer may be used for the measurement of flammable gases provided that the flammable portion does not up-scale 15 Vol.-% CH_4 or does not up-scale C1 equivalents.

Note

The analyzer cannot be used in combination with the integral gas feed.

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Safe operation of the gas analyzer

The device concept ensures that a concentration of combustible gas or an explosive mixture of combustible gas and ambient air cannot occur in the interior of the gas analyzer during normal operation.

The interior of the gas analyzer cannot be allocated to an (explosion protection) zone; an explosive gas mixture cannot escape to the outside.

The end user must make the following provisions to ensure safe operation of the gas analyzer:

- The combustion gas flow rate must be limited to a maximum of 10 l/h H_2 or 25 l/h H_2/He mixture. For this purpose, the end user has to provide suitable measures outside the gas analyzer.
- A shut-off valve must be installed in the combustion gas supply line to increase safety in the following operating conditions: shutting down the gas analyzer, failure of the instrument air supply, leakage in the combustion gas feed path inside the gas analyzer. This shut-off valve should be installed outside the analyzer house near the combustion gas supply.

Electrochemical oxygen sensor

Measuring principle

Electrochemical oxygen sensor

Sample components and measurement ranges

Sample component

Oxygen (O_2)

Smallest measuring range

0 to 5 vol.% O_2

Measuring range quantity and measuring range limits

1 to 2 measuring ranges
adjustable from 0 to 5 vol. % O_2 to 0 to 25 vol. % O_2

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They relate to the smallest measurement range.

Linearity error

≤ 1 % of measuring span

Repeatability

≤ 0.5 % of span

Zero drift

Stable over long-term due to absolute zero point

Span drift

≤ 1 % of the measurement range per week

Output signal fluctuation (2 σ)

≤ 0.2 % of the total measuring range at electronic T_{90}-time (static/dynamic) = 5/0 s

Detection limit (4 σ)

≤ 0.4 % of the total measuring range with electronic T_{90}-time (static/dynamic) = 5/0 s

Influences

Flow effect

Flow rate in the 20 to 100 l/h range:
≤ 2 % of the total measuring range

Temperature effect

Ambient temperature in the permissible range:
≤ 0.2 vol.% O_2 per 10 °C

Air pressure effect

- At the zero point:
  no influence effect
- On sensitivity without pressure correction:
  ≤ 1 % of the measured value per 1 % of air pressure change
- on sensitivity without pressure correction
  ≤ 0.2 % of the measured value per 1 % air pressure change
  Pressure correction is only possible if the oxygen sensor is connected to an analyzer module with an integral pressure sensor.

Power supply effect

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

Dynamic response

T_{90}time

T_{90} ≤ 30 sec, depending on sample gas flow and system layout

Calibration

Calibration	Test gas
Zero-point calibration	The oxygen sensor zero is not calibrated since it is fundamentally stable.
End-point calibration	Ambient air with 20.96% Vol.-% O_2 or with synthetic air

Materials

- Sensor:
  polystyrene ABS, PTFE, FPM (fluoro rubber)
- Housing:
  PVC-U, FPM gasket (fluoro rubber)
- Gas connections:
  Stainless steel 1.4571 (AISI 316Ti)

Note

The oxygen sensor can only be used in combination with Uras26 or Limas23 in the sample gas path. Two oxygen sensors can be used in combination with Uras26 with separate gas paths (only in model EL3020). The oxygen sensor cannot be used when the internal gas lines in Uras26 are made of stainless steel or PTFE pipes.

Sample gas conditions

Sample gas inlet conditions

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

Electrochemical oxygen sensor - Sample gas input conditions	
Temperature	
If the sample gas taken from the process is hotter than the coldest point in the sample gas path, it can condensate there, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement.	
Moisture content	
H_2O dew point ≥ 2 °C	
The oxygen sensor may not be used with dry sample gases.	
Pressure	
Internal pressure drop:	< 5 hPa at standard flow rate of 60 l/h
Flow rate	20 to 100 l/h

Associated gas

The oxygen sensor may not be used if the associated gas contains the following components:

H_2S, compounds containing chlorine or fluorine, heavy metals, aerosols, mercaptans, alkaline components

Requirements for the sample gas outlet

The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere.

Integrated gas feed

Version

The integral gas feed (optional in model EL3020) is available in two versions.
Depending on the version, the integrated gas extraction system consists of the following components:

- Version 1: Solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
- Version 2: Flow sensor.

Test gas supply

Version
3/2-way solenoid valve

Power
approx. 3 W

Materials
PVDF, FPM

Gas supply

Version
Magnetic piston pump

Feed rate
≤ 50 l/h depending on the analyzer type and inlet/outlet pressure

Flow
Adjustable

Power
approx. 10 W

Materials
PVDF, EPDM, stainless steel 1.4571

Note

- The integral gas feed cannot be used when the internal gas lines are made up of stainless steel or PTFE pipes.
- The integral gas feed cannot be used in combination with the analyzer modules Limas23, Magnos27, ZO23 or Fidas24.

Flow monitor

Version
Miniature flow sensor

Materials
Al_2O_3, silicon, gold, GFK

Sample gas inlet conditions

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

Integrated gas production - Sample gas input conditions	
Temperature	
• 5 to 45 °C • If the sample gas taken from the process is hotter than the coldest point in the sample gas path, there may be condensation at this point, if the gas contains components that can condense. Therefore, the sample gas dew point should be at least 5 °C below the lowest temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is an absolute requirement.	
Flow rate	30 to 60 l/h

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

Special versions

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, Magnos28, Caldos27 and ZO23 (concentration max. 100 ppm) is suitable for measuring flammable gases in non-explosive environments.

In model EL3040, housing purge with nitrogen (ZO23: with air) must be provided.

The positive pressure in the sample gas feed path may not exceed a maximum value of 100 hPa in normal operation and a maximum value of 500 hPa in the event of a fault.

The gas analyzer with Magnos28 can be used up to an absolute pressure of 1200 hPa.

The special requirements must be observed (see operating instruction).

Version in category II 3G for measurement of non-flammable gases

The gas analyzer (model EL3040) with Uras26, Magnos28, Caldos27 and electrochemical oxygen sensor is approved for explosion protection and suited for use in potentially explosive atmospheres when in compliance with the specification.

The gas analyzer may be used for measurement of non-flammable gases and vapors.
The gas analyzer is marked in accordance with the European directive 2014/34/EU as:
Ex II 3G Ex nA nC IIC T4 Gc

In undisturbed operation there cannot be any sparking, arcing or impermissible temperatures inside the device.

Explosion protection through:

- non-sparking instruments and equipment with low power consumption,
- sealed or encapsulated equipment.

The gas analyzer with Magnos28 can be used for non-flammable sample gas up to an absolute pressure of 1600 hPa.

Type Examination Certificate No. BVS 16 ATEX E 085 X

IP rating: IP65

Note
The special requirements must be observed (see operating instruction).

General data

Operation

LCD Indicator

Backlit graphics display, 240 x 160 pixel resolution.

Measured value display

- Numerical value with physical unit, also with bargraph in single display
- Resolution better than 0.2 % of the measuring span
- Simultaneous display of up to 5 measured values
- Flow rate: Bar display

Status display

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

Use

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

Measuring range switchover and measuring range feedback

The measuring range can be switched over either manually on the gas analyzer or automatically (‘autorange’) by means of appropriately configured switch-over thresholds or externally controlled via appropriately configured digital inputs.

The measuring range feedback can be implemented via appropriately configured digital outputs; it is independent of the se- lected type of measuring range switch-over. The gas analyzer is set ex works to measuring range 2 and to manual measuring range switchover.

Limit value monitoring

Using the ECT configuration program (“EasyLine Configuration Tool”), limit values can be set. The limit value signals (alarms) are output via digital outputs.

Housing

	Model EL3020	Model EL3040
Design	19” housing	Wall-mount housing
IP rating	IP20 IP40 (only with version for emissions measurement)	IP65, IP54 (for Fidas24* and ZO23)
Materials		
• Housing:	Galvanized sheet steel Outer surfaces varnished	Stainless steel 1.4016 Outer surfaces varnished
• Rear wall:	Aluminum, PVC-C	Aluminum PVC-C
• Keyboard foil:	Polyester	Polyester
Colors	Light gray (RAL 7035), basalt gray (RAL 7012)	Light gray (RAL 7035), basalt gray (RAL 7012)
Weight	approx. 7 to 15 kg	approx. 13 to 21 kg
Dimensions	See page 69	See page 70

* IP rating IP54 not for the pressure equalization opening of the Fidas24, see **Gas connections and electrical connections Fidas24 (model EL3040)** on page 68.

Housing purge

Housing purge is mandatory when measuring flammable gases. Possible only with model EL3040 (wall-mount housing).

Housing purge (EL3040 only)	
Purge Gas Flow Rate during Operation	10 to 20 l/h
Purge gas pressure p_e	2 to 4 hPa

Pressure sensor

Use

Analyzer module	Pressure sensor
Uras26, Limas23, Caldos27	Factory-installed as standard
Magnos28, Magnos27	Factory-installed as an option

Working range

p_{abs} = 600 to 1250 hPa

Materials

Silicone gel, plastics, FPM (Fluorocarbon rubber)

Sample gas composition

The pressure sensor must not be connected to the sample gas path when the sample gas is corrosive, flammable or explosive.

Fine filter

Version

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

Retention rate

99.99 % for particles > 0.1 µm

Materials of the wetted parts

Polyamide, borosilicate glass with PVDF binder

Power supply

Electric information (entire device)

The power supply built into the system housing is used to supply 24 V DC to the analyzer module and the associated electronics.

Input voltage

100 to 240 V AC, −15/+10 %;
50 to 60 Hz, ±3 Hz

Power

Maximum 187 VA (without heaters from Fidas24)

Connection

3-pole cold device plug in accordance with EN 60320-1/C14
(Power cable included in scope of supply)

Battery

Application

Supply to the built-in clock in case of a voltage failure.

Type

- Varta CR 2032 type no. 6032 or
- Renata type no. CR2032 MFR

Note
Only the original types specified above may be used as a spare part.

Electric information (analyzer modules)

Input voltage

24 V DC, ±5 %

Power

Power consumption analyzer modules (DC)			
Uras26:	Max. 95 W	ZO23:	Max. 35 W
Limas23:	Max. 100 W	Caldos27:	Max. 17 W
Magnos28:	Max. 50 W	Fidas24:	Max. 50 W
Magnos27:	Max. 35 W		

Fidas24 Analyzer Module (AC) Detector and Sample Gas Inlet Heaters	
Input voltage	115 V AC or 230 V AC, ±15 % (max. 250 V AC), 50 to 60 Hz, ±3 Hz
Power consumption	125 VA for the detector heater, 125 VA for the heated sample gas inlet (option)
Connection	4-pin male connector (connection cable included in scope of supply)

… General data

Safety

In accordance with EN 61010-1

Protection class

Protection class I

Overvoltage category

II

Pollution degree

2

Safe isolation

The power supply is electrically isolated from other circuits by means of reinforced or double insulation. Protective Extra Low Voltage (PELV) on low-voltage side.

Electromagnetic compatibility

In accordance with EN 61326-1

Noise immunity

Inspection level: industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.

Emitted interference

Limit values class B for electromagnetic radiation disturbance and conducted disturbance are met.

Mechanical stress

Tested to EN 60068-2-6:1996

Operation

Swing test:
In Uras26, slight transient effects on the measured value can occur in the region of the modulation frequency.

Transport

Swing and shock test:
In its original packaging, the gas analyzer withstands normal shipping conditions.

Requirements for the installation site

Installation location

- The gas analyzer is intended for indoor installation only.
- The mounting surface must be sufficiently stable to support the weight of the gas analyzer!
- For safe installation and disassembly, we recommend supporting the 19” housing in the cabinet or rack with slide rails!

Installation location altitude

Maximum 2000 m (6560 ft) above sea level (over 2000 m (6560 ft) on request)

Adequate air circulation

Provide for adequate natural air circulation around the gas analyzer. Avoid heat build-up.

Model EL3020 – 19” housing

With the EL3020 in the 19” housing, the distance from neighboring housings must be at least 1RU (rack unit) upwards and downwards and 3 cm to the rear.

Model EL3040 – wall-mounted enclosure

With the EL3040 in the wall housing, the distance to the neighboring housings must be at least 3 cm.

Installation in closed cabinets

When a gas analyzer is installed in a closed cabinet, the cabinet must be sufficiently ventilated (at least 1 x air change per hour).

Climatic Conditions

Ambient temperature

- During operation:
  5 to 45 °C
- Uras26 in combination with another analyzer, Limas23, Fidas24:
  5 to 40 °C

Transport-/Storage temperature

–25 to 65 °C

Relative humidity

Maximum 75 %, no condensation

Air Pressure

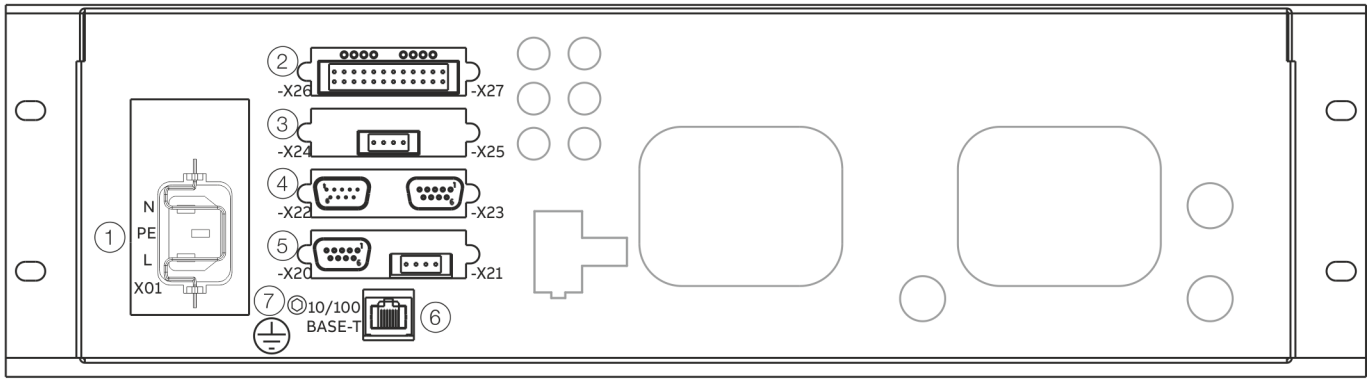
Atmospheric conditions

Electrical connections

Model EL3020

Safety instructions

Observe the relevant national safety regulations for installing and operating electric systems.



1. Power supply connection
   (see **Digital I/O module** on page 36)
   (3-pin grounded instrument connector in accordance with EN 60320-1/C14; connection cable included in scope of supply)
2. Digital I/O module
   (see **Analog output modules** on page 36)
3. Analog output module
   (see **Modbus®-Module** on page 35)
4. Modbus® module
   (see **PROFIBUS®-Module** on page 35)
5. PROFIBUS® module
   (siehe **RS485 interface** on page 35)
6. Ethernet 10/100BASE-T interface (for configuration and software update as well as for transferring the QAL3 data)
7. Potential equalization connection (terminal capacity max. 4 mm^2)

Figure 1: Electrical connections model EL3020

Note

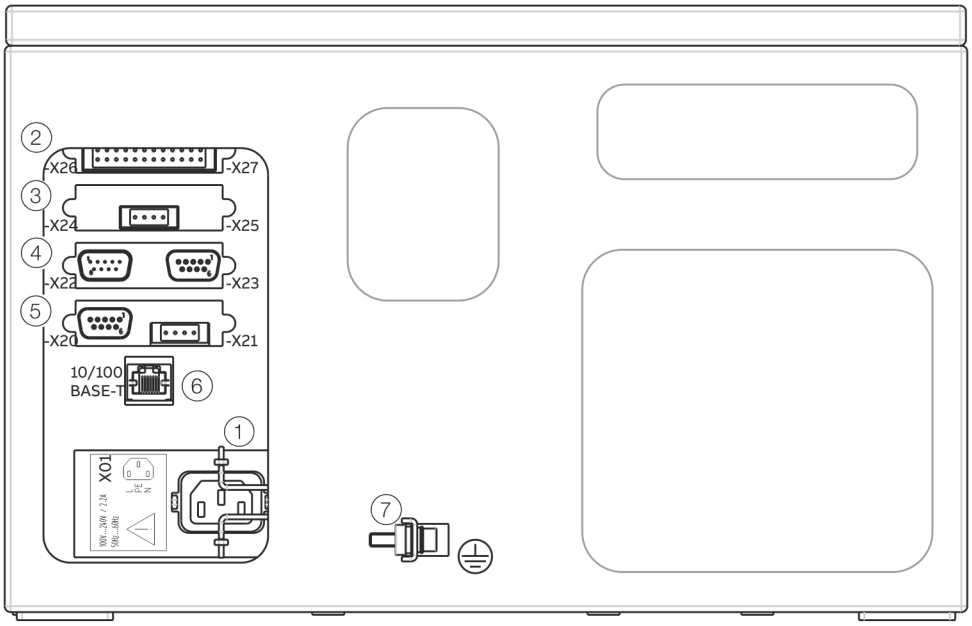
The figure shows all available I/O module types and shows only an example of the assembly with I/O modules (max. 4). The actual assembly of a delivered gas analyzer may differ from this; it is documented in the device data sheet.

… Electrical connections

Model EL3040

Safety instructions

Observe the relevant national safety regulations for installing and operating electric systems.



1. Power supply connection
   (see **Digital I/O module** on page 36)
   (3-pin grounded instrument connector in accordance with EN 60320-1/C14; connection cable included in scope of supply)
2. Digital I/O module
   (see **Analog output modules** on page 36)
3. Analog output module
   (see **Modbus®-Module** on page 35)
4. Modbus® module
   (see **PROFIBUS®-Module** on page 35)
5. PROFIBUS® module
   (see **RS485 interface** on page 35)
6. Ethernet 10/100BASE-T interface (for configuration and software update as well as for transferring the QAL3 data)
7. Potential equalization connection (terminal capacity max. 4 mm²)

Figure 2: Electrical connections model EL3040

Note

The figure shows all available I/O module types and shows only an example of the assembly with I/O modules (max. 4). The actual assembly of a delivered gas analyzer may differ from this; it is documented in the device data sheet.

PROFIBUS®-Module

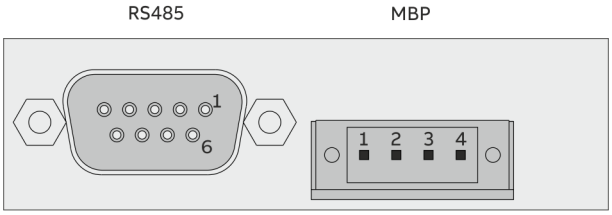


Image 3: PROFIBUS® module

RS485 interface

Version: 9-pin sub-D female connector

Pin	Signal	Description
1	—	not assigned
2	M24	24 V output voltage, ground
3	RxD/TxD-P	Receive/transmit data plus, B-line
4	—	not assigned
5	DGND	Data transmission potential (Reference potential for VP)
6	VP	Supply voltage plus (5 V)
7	P24	24 V output voltage plus, max. 0.2 A
8	RxD/TxD-N	Receive/transmit data N, A-line
9	—	not assigned

MBP Interface (not intrinsically safe)

Model: 4-pole plug-in terminal strip with mating connector (included in the scope of delivery).

Pin	Signal
1	+
2	Shield
3	–
4	not used

Modbus®-Module

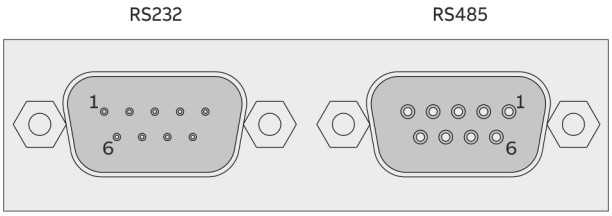


Figure 4: Modbus module

RS232 Interface

Version: 9-pin sub-D male connector

Pin	Signal
2	RxD
3	TxD
5	GND

RS485 interface

Version: 9-pin sub-D female connector

Pin	Signal
2	RTxD-
3	RTxD+
5	GND

… Electrical connections

Analog output modules

Analog outputs AO1 to AO4

0/4 to 20 mA (factory-set to 4 to 20 mA), common negative pole, electrically isolated from ground, freely connectible to ground, max. gain relative to protective ground potential 50 V, max. load 750 Ohm. 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 name plate.

Note

The allocation of the terminals can be changed in the configurator.

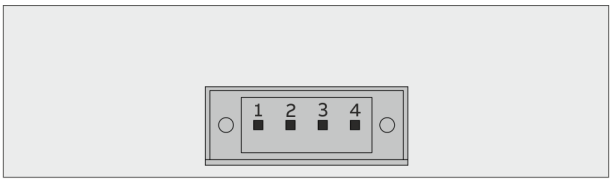


Figure 5: 2-way analog output module

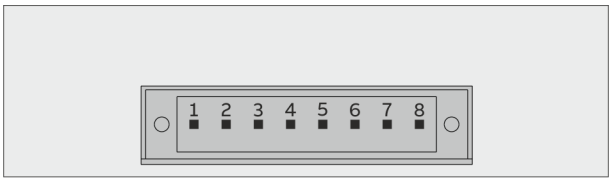


Figure 6: 4-way analog output module

Pin	Signal
1	AO1+
2	AO1–
3	AO2+
4	AO2–
5	AO3+
6	AO3–
7	AO4+
8	AO4–

Digital I/O module

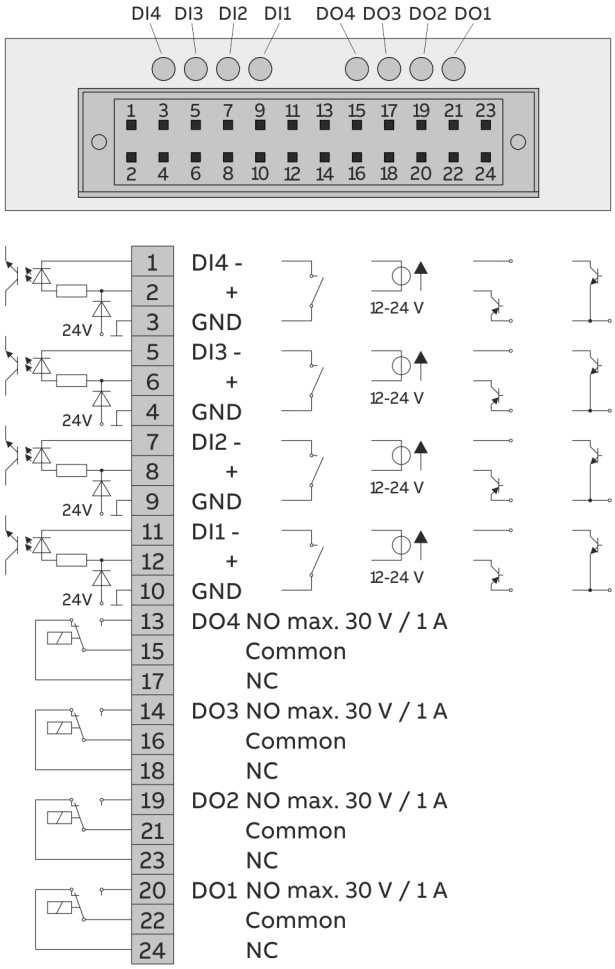


Figure 7: Electrical connections, digital I/O module

Digital inputs DI1 to DI4

Optocouplers with internal 24 V DC power supply. Control system alternatively available with potential-free contacts, with external voltage 12 to 24 V DC or with PNP or NPN open-collector driver.

Digital outputs DO1 to DO4

Potential-free changeover contacts, maximum contact load capacity 30 V/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).
Relays are shown in the unpowered state.
The unpowered state corresponds to the state in the event of a fault ("fail safe").

Version

2 × 12-pole plug-in terminal strip with mating connector (included in the scope of delivery).

Standard assignment of digital inputs and digital outputs

Function	Digital I/O Module 1	Digital I/O Module 2
Failure		
Maintenance required		
Maintenance mode		
Overall status	**DO1**	
Start automatic calibration	**DI1**	
Stop automatic calibration		
Disable automatic calibration	**DI2**	
Sample gas valve	**DO4**	
Zero point gas valve		
Span gas valve 1		
Span gas valve 2		
Span gas valve 3		
Span gas valve 4		
Span gas valve 5		
Pump, on/off*		
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		
Measuring component switch-over		
Measuring component feedback		
Bus-DI 1		
Bus-DI 2		
Bus-DI 3		
Bus-DI 4		
Bus-DI 5		
Bus-DI 6		
Bus-DI 7		
Bus-DI 8		
External failure**	**DI3**	
External maintenance request**	**DI4**	

* If a pump is installed ('Integral gas feed' option – only in model EL3020, not for Limas23, ZO23, Fidas24).

** Multiple external status signals can be configured depending on the number of free digital inputs.

Note

The allocation of the terminals (see Operating instruction) can be changed in the configurator.

Gas connections

Position and design of the gas connections

The following pages list the location and execution of the gas connections of the individual analyzer modules and their combinations.

The table below is used as an aid in navigating the connection descriptions.

Position and design of the gas connections

Analyzer module	Model EL3020	Model EL3040
Uras26	see page 39	see page 41
Uras26 with Magnos28	see page 42	see page 44
Uras26 with Caldos27	see page 46	see page 48
Limas23	see page 50	see page 51
Limas23 with Magnos28	see page 52	see page 53
Magnos28	see page 55	see page 59
Magnos28 with Magnos28	see page 56	—
Magnos28 with Caldos27	see page 57	—
Magnos27	see page 60	—
Magnos27 with Uras26	see page 61	—
ZO23	see page 62	see page 63
Caldos27	see page 64	see page 66
Caldos27 with Caldos27	see page 65	—
Fidas24	see page 67	see page 68

Gas connections Uras26 (model EL3020)

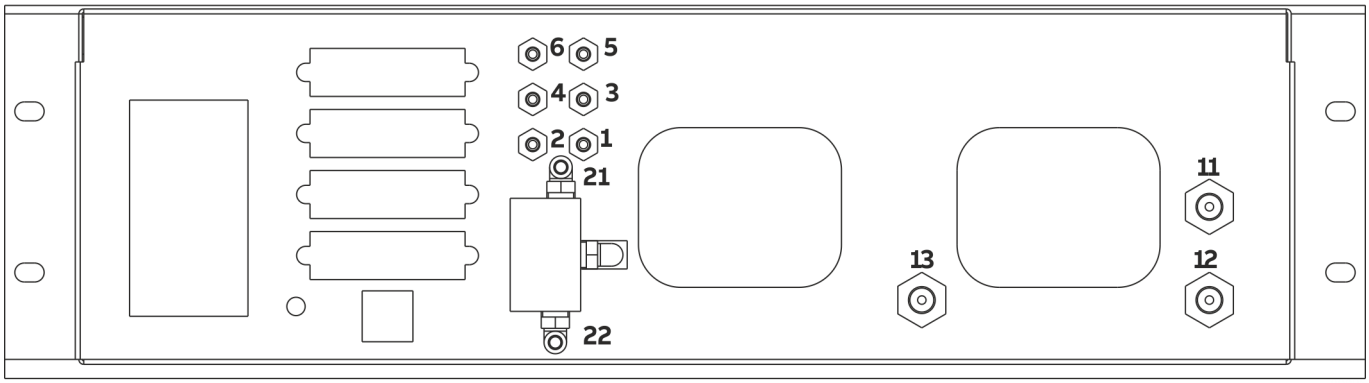


Figure 8: Gas connections Uras26 (EL3020)

Uras26: Gas connections for hose lines

(internal gas lines made using hoses)

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet (gas path 1)	Without 'integrated gas feed' option	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas outlet (gas path 1)	—	
3	Sample gas outlet (gas path 1)	For 'Integrated gas feed' option, factory-connected to sample gas inlet Pos. **1** (gas path 1)	
4	Sample gas inlet (gas path 1)	For 'Integrated gas feed' option with flow sensor only (without solenoid valve)	
	Pressure sensor	For 'Pressure sensor connected to the outside by hose' option	
5	Sample gas inlet (gas path 2)	For second sample gas or flowing reference gas, sample cell 1 (depending on the design of the analyzer)	
6	Sample gas outlet (gas path 2)		
21	Sample gas inlet (gas path 1)	On solenoid valve with 'integral gas feed' option with solenoid valve, pump, filter, capillary and flow sensor	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet (gas path 1)		

Note

The pressure sensor (standard, not for the 'pressure sensor connected to outside by hose' option), and the oxygen sensor (option) are internally connected as follows:

- In the output of the measuring cell 1, with a measuring cell and in the case of separate gas paths.
- In the output of measuring cells 2 for two measuring cells in series.
- The second O2 sensor (option for version with separate gas paths) is connected downstream of the sample cell 2 outlet.

… Gas connections

… Gas connections Uras26 (model EL3020)

Uras26: Gas connections for pipework
(internal gas lines designed as stainless steel pipes)

Pos.	Connection	Supplementary information	Design
6	Pressure sensor	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
11	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305) for threaded connections (not included in the delivery)
12	Sample gas outlet	For a sample cell	
13	Sample gas outlet	For two sample cells in series	

Note
The oxygen sensor, the ‘integrated gas feed’ option and the version with separated gas paths are not possible.

Gas connections Uras26 (model EL3040)

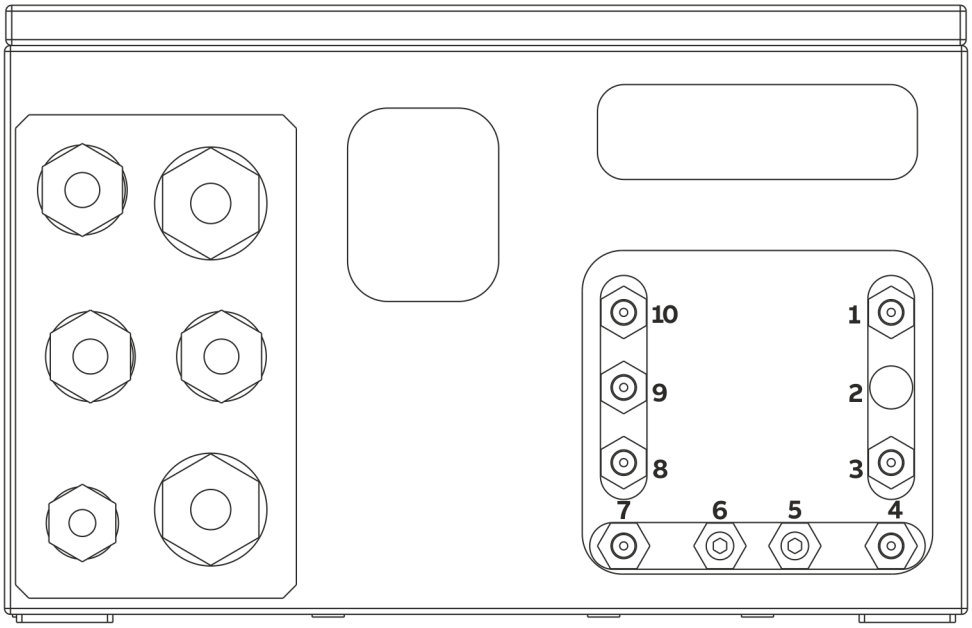


Figure 9: Gas connections Uras26 (model EL3040)

Uras26: Gas connections

Pos.	Connection	Supplementary information	Design
1	Pressure sensor	The pressure sensor is connected to Terminal **1** if the internal gas lines are designed as stainless steel pipes, or if the 'Pressure sensor connected outside by hose' option is ordered.	⅛ NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	not used	—	
3	Sample gas inlet (gas path 1)	—	
4	Sample gas outlet (gas path 1)	For a measuring cell and for two measuring cells with separate gas paths	
5	Purge gas inlet (housing)	—	
6	Purge gas outlet (housing)	—	
7	Sample gas inlet (gas path 2)	—	
8	Sample gas outlet (gas path 2)	—	
	Sample gas outlet (gas path 1)	For two sample cells in series	
9	Reference gas inlet	Sample cell 1 flowing reference gas	
10	Reference gas outlet		

Note

- If the internal gas lines ares designed as hoses, the pressure sensor (standard, not for the 'pressure sensor connected to outside by hose' option), and the oxygen sensor (option) are internally connected as follows:
  - In the output of measuring cell 1, for one measuring cell and for two measuring cells with separate gas paths.
  - In the output of measuring cell 2 for two measuring cells in a series.
  - The second oxygen sensor (option for version with separate gas paths) is connected in the outlet of sample cell 2.
- If the internal gas lines are designed as stainless steel pipes, the oxygen sensor and the version with separated gas paths are not possible.

… Gas connections

Gas connections Uras26 with Magnos28 (model EL3020)

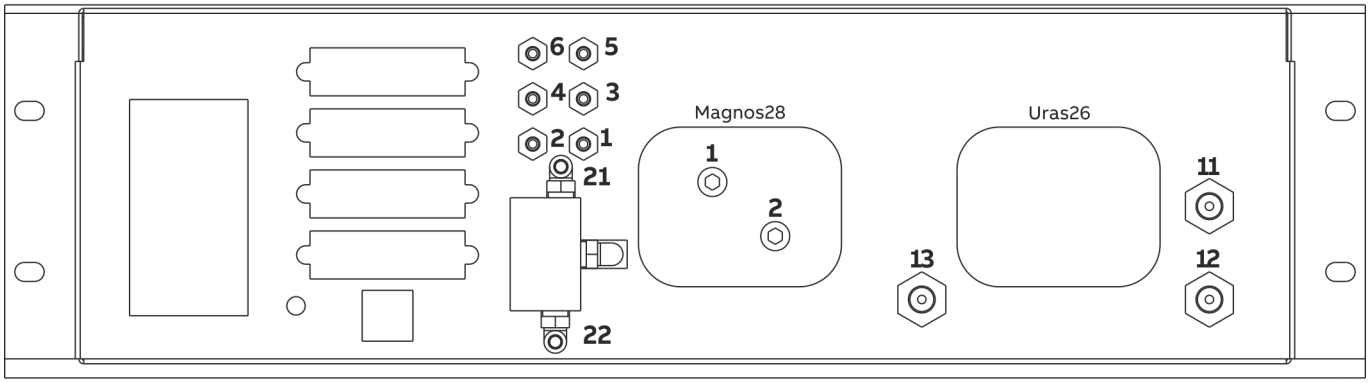


Figure 10: Gas connections Uras26 with Magnos28 (EL3020)

Uras26: Gas connections for hose lines

(internal gas lines made using hoses)

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet (gas path 1)	Without ‘integrated gas feed’ option	Weld-in spud with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas outlet (gas path 1)	—	
3	Sample gas outlet (gas path 1)	For ‘Integrated gas feed’ option, factory-connected to sample gas inlet Pos.**1** (gas path 1)	
4	Sample gas inlet (gas path 1)	For ‘Integrated gas feed’ option with flow sensor only (without solenoid valve)	
	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	
5	Sample gas inlet (gas path 2)	For second sample gas or flowing reference gas, sample cell 1 (depending on the design of the analyzer)	
6	Sample gas outlet (gas path 2)		
21	Sample gas inlet (gas path 1)	On solenoid valve with ‘integral gas feed’ option with solenoid valve, pump, filter, capillary and flow sensor	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet (gas path 1)		

Note

- The oxygen sensor is not possible in combination with Magnos28
- The pressure sensor (standard, not for the ‘pressure sensor connected to outside by hose’ option) are internally connected as follows:
  - In the output of the measuring cell 1, with a measuring cell and in the case of separate gas paths.
  - In the output of measuring cell 2 for two measuring cells in a series.

Uras26: Gas connections for pipework
(internal gas lines designed as stainless steel pipes)

Pos.	Connection	Supplementary information	Design
6	Pressure sensor	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
11	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305) for threaded connections (not included in the delivery)
12	Sample gas outlet	For a sample cell	
13	Sample gas outlet	For two sample cells in series	

Note
The oxygen sensor, the 'integrated gas feed' option and the version with separated gas paths are not possible.

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	Sample gas outlet	—	

Note
The sample gas inlet of Magnos28 can be optionally connected at the factory to the sample gas output (gas path 1) of Uras26 or have a separate sample gas path without connection to Uras26.

… Gas connections

Gas connections Uras26 with Magnos28 (model EL3040)

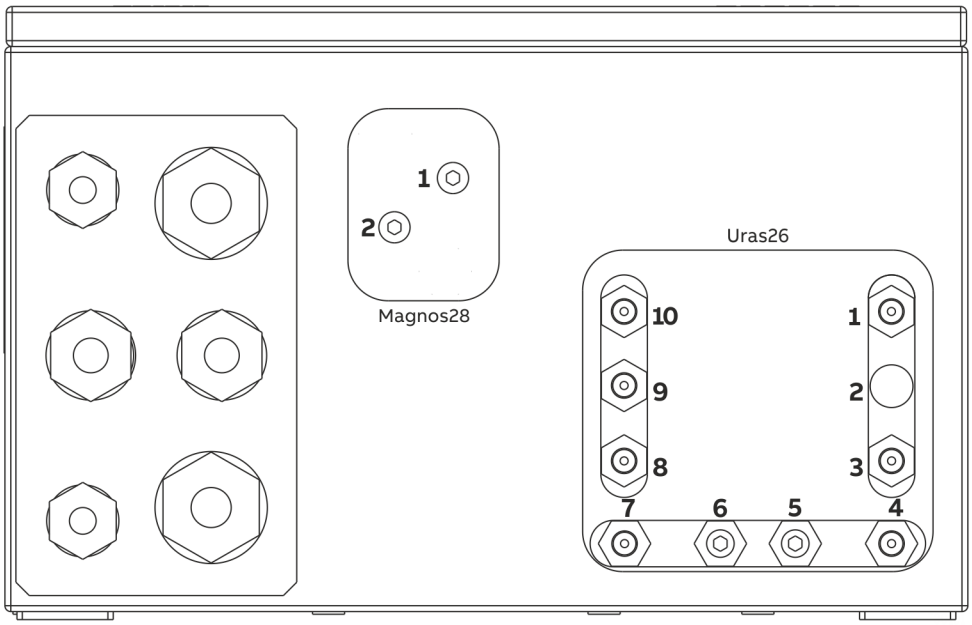


Figure 11: Gas connections Uras26 with Magnos28 (model EL3040)

Uras26: Gas connections

(internal gas lines designed as hoses or stainless steel pipes)

Pos.	Connection	Supplementary information	Design
1	Pressure sensor	The pressure sensor is connected to Terminal **1** if the internal gas lines are designed as stainless steel pipes, or if the 'Pressure sensor connected outside by hose' option is ordered.	⅛ NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	not used	—	
3	Sample gas inlet (gas path 1)	—	
4	Sample gas outlet (gas path 1)	For a measuring cell and for two measuring cells with separate gas paths	
5	Purge gas inlet (housing)	—	
6	Purge gas outlet (housing)	—	
7	Sample gas inlet (gas path 2)	—	
8	Sample gas outlet (gas path 2)	—	
	Sample gas outlet (gas path 1)	For two sample cells in series	
9	Reference gas inlet	Sample cell 1 flowing reference gas	
10	Reference gas inlet		

Note

- The oxygen sensor is not possible in combination with Magnos28
- If the internal gas lines ares designed as hoses, the pressure sensor (standard, not for the 'pressure sensor connected to outside by hose' option), and the oxygen sensor (option) are internally connected as follows:
  - In the output of measuring cell 1, for one measuring cell and for two measuring cells with separate gas paths.
  - In the output of measuring cells 2 for two measuring cells in series.
- If the internal gas lines are designed as stainless steel pipes, the version with separated gas paths is not possible.

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread
2	Sample gas outlet	—	(stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)

Note

The sample gas inlet of Magnos28 can be optionally connected at the factory to the sample gas output (gas path 1) of Uras26 or have a separate sample gas path without connection to Uras26.

… Gas connections

Gas connections Uras26 with Caldos27 (model EL3020)

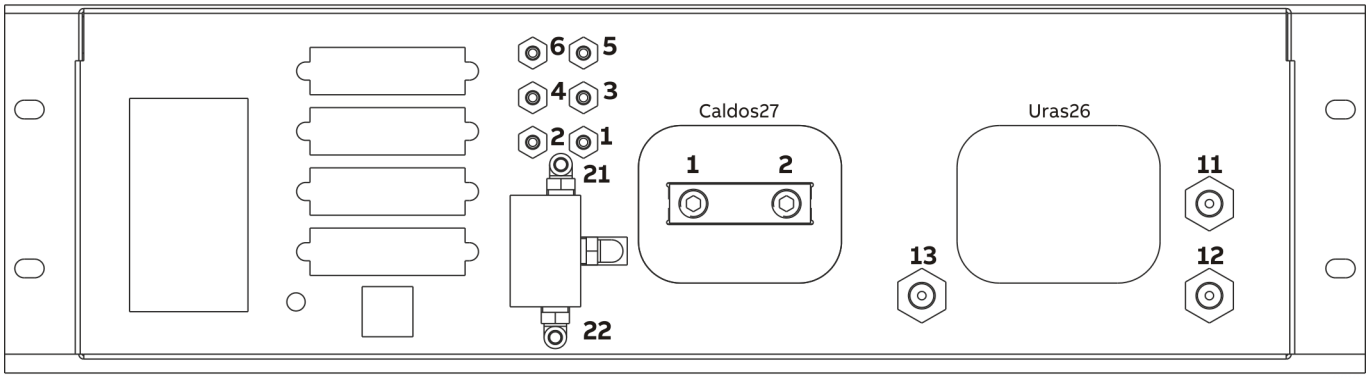


Figure 12: Gas connections Uras26 with Caldos27 (model EL3020)

Uras26: Gas connections for hose lines

(internal gas lines made using hoses)

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet (gas path 1)	Without ‘integrated gas feed’ option	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas outlet (gas path 1)	—	
3	Sample gas outlet (gas path 1)	For ‘Integrated gas feed’ option, factory-connected to sample gas inlet **Pos. 1** (gas path 1)	
4	Sample gas inlet (gas path 1)	For ‘Integrated gas feed’ option with flow sensor only (without solenoid valve)	
	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	
5	Sample gas inlet (gas path 2)	For second sample gas or flowing reference gas, sample cell 1 (depending on the design of the analyzer)	
6	Sample gas outlet (gas path 2)		
21	Sample gas inlet (gas path 1)	On solenoid valve with ‘integral gas feed’ option with solenoid valve, pump, filter, capillary and flow sensor	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet (gas path 1)		

Note

- The oxygen sensor is not possible in combination with Caldos27
- The pressure sensor (standard, not for the ‘pressure sensor connected to outside by hose’ option) are internally connected as follows:
  - In the output of the measuring cell 1, with a measuring cell and in the case of separate gas paths.
  - In the output of measuring cell 2 for two measuring cells in a series.

Uras26: Gas connections for pipework
(internal gas lines designed as stainless steel pipes)

Pos.	Connection	Supplementary information	Design
6	Pressure sensor	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
11	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305) for threaded connections (not included in the delivery)
12	Sample gas outlet	For a sample cell	
13	Sample gas outlet	For two sample cells in series	

Note
The oxygen sensor, the 'integrated gas feed' option and the version with separated gas paths are not possible.

Caldos27: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)

Note
The sample gas inlet of Caldos27 can be optionally connected at the factory to the sample gas output (gas path 1) of Uras26 or have a separate sample gas path without connection to Uras26.

… Gas connections

Gas connections Uras26 with Caldos27 (model EL3040)

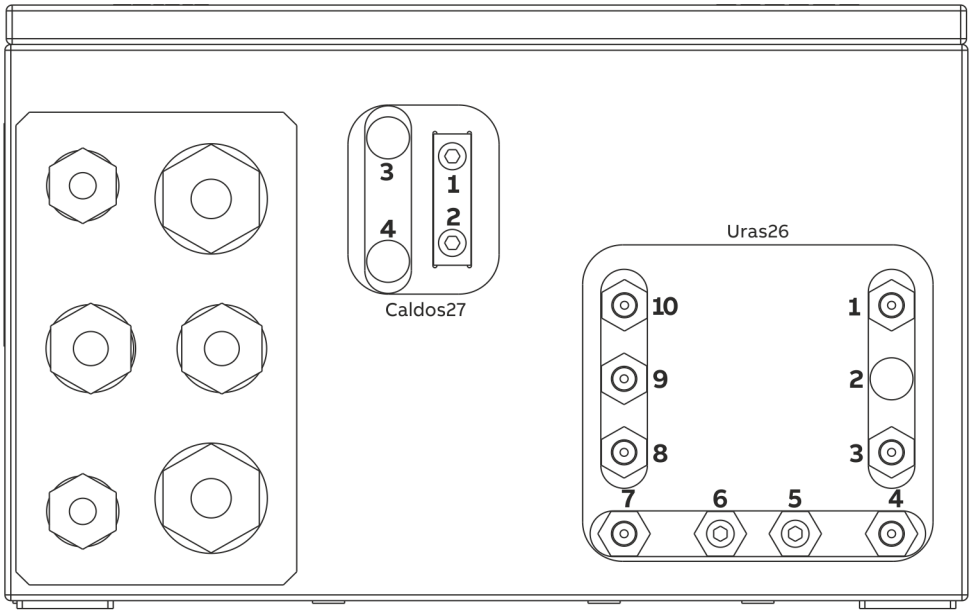


Figure 13: Gas connections Uras26 with Caldos27 (model EL3040)

Uras26: Gas connections

Pos.	Connection	Supplementary information	Design
1	Pressure sensor	The pressure sensor is connected to Terminal **1** if the internal gas lines are designed as stainless steel pipes, or if the 'Pressure sensor connected outside by hose' option is ordered.	⅛-NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	not used	—	
3	Sample gas inlet (gas path 1)	—	
4	Sample gas outlet (gas path 1)	For a measuring cell and for two measuring cells with separate gas paths	
5	Purge gas inlet (housing)	—	
6	Purge gas outlet (housing)	—	
7	Sample gas inlet (gas path 2)	—	
8	Sample gas outlet (gas path 2)	—	
	Sample gas outlet (gas path 1)	For two sample cells in series	
9	Reference gas inlet	Sample cell 1 flowing reference gas	
10	Reference gas inlet		

Note

- The oxygen sensor is not possible in combination with Caldos27
- If the internal gas lines ares designed as hoses, the pressure sensor (standard, not for the 'pressure sensor connected to outside by hose' option), and the oxygen sensor (option) are internally connected as follows:
  - In the output of measuring cell 1, for one measuring cell and for two measuring cells with separate gas paths.
  - In the output of measuring cells 2 for two measuring cells in series.
- If the internal gas lines are designed as stainless steel pipes, the version with separated gas paths is not possible.

Caldos27: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	Sample gas outlet	—	
3	not used	—	
4	not used	—	

Note

The sample gas inlet of Caldos27 can be optionally connected at the factory to the sample gas output (gas path 1) of Uras26 or have a separate sample gas path without connection to Uras26.

… Gas connections

Gas connections Limas23 (model EL3020)

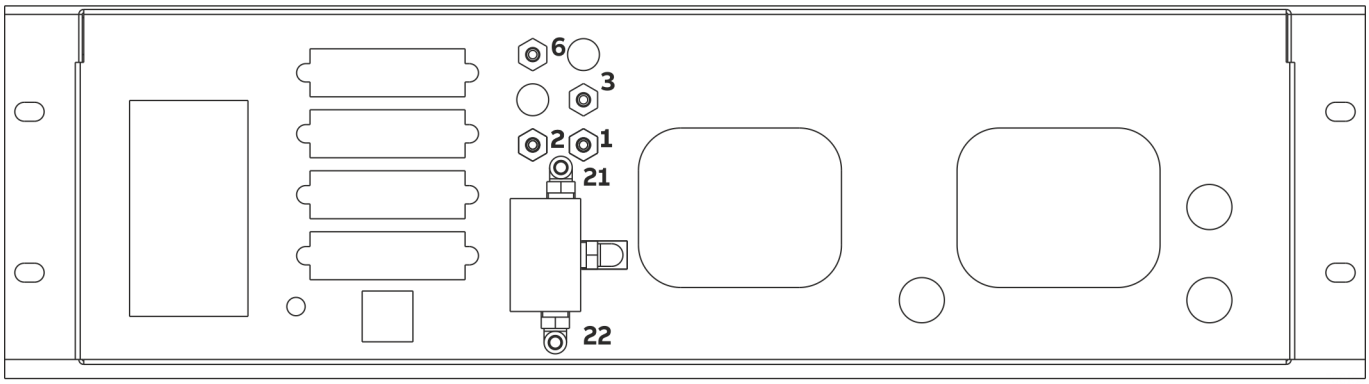


Figure 14: Gas connections Limas23 (model EL3020)

Limas23: Gas connections

Pos.	Connection	Supplementary information	Version
1	Sample gas inlet	Without optional solenoid valve	Screwed connections with hose nozzles (stainless steel 1.4305) for hoses with 4 mm inside diameter (included in scope of supply)
2	Sample gas outlet	—	
3	Sample gas outlet	With optional solenoid valve, factory-connected to sample gas input **Pos. 1**	
6	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	
21	Sample gas inlet	With optional solenoid valve	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet		

Note

The pressure sensor (standard, not for the ‘pressure sensor connected to outside by hose’ option), and the oxygen sensor (option) are internally connected in the outlet of the sample cell.

Gas connections Limas23 (model EL3040)

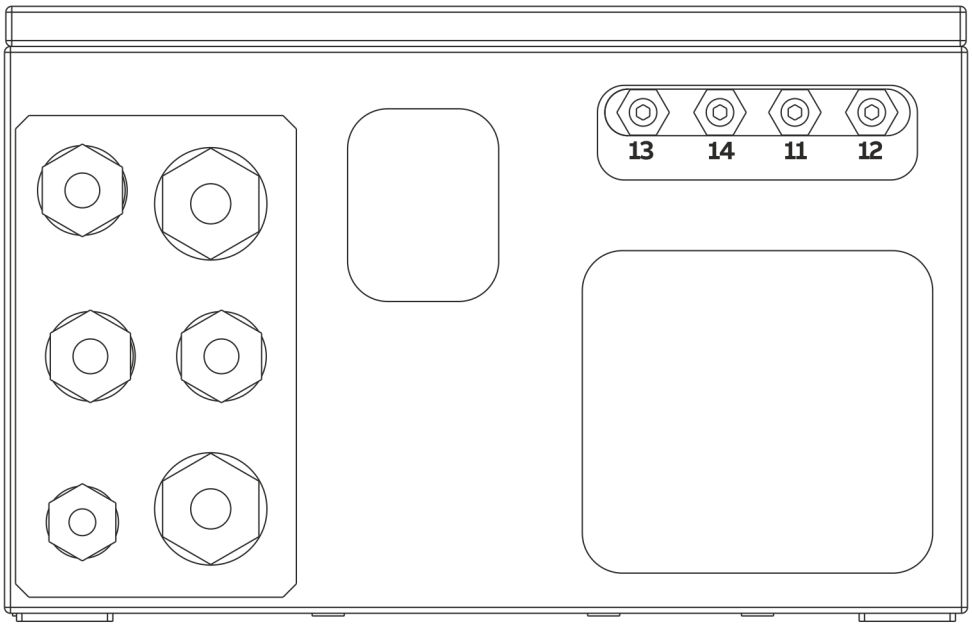


Figure 15: Gas connections Limas23 (model EL3040)

Limas23: Gas connections

Pos.	Connection	Supplementary information	Design
13	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305)
14	Sample gas outlet	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
11	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	
	Purge gas inlet (housing)	Not for ‘Pressure sensor connected to the outside by hose’ option	
12	Purge gas outlet (housing)	Not for ‘Pressure sensor connected to the outside by hose’ option	

Note

The pressure sensor (standard, not for the ‘pressure sensor connected to outside by hose’ option), and the oxygen sensor (option) are internally connected in the outlet of the sample cell.

… Gas connections

Gas connections Limas23 with Magnos28 (model EL3020)

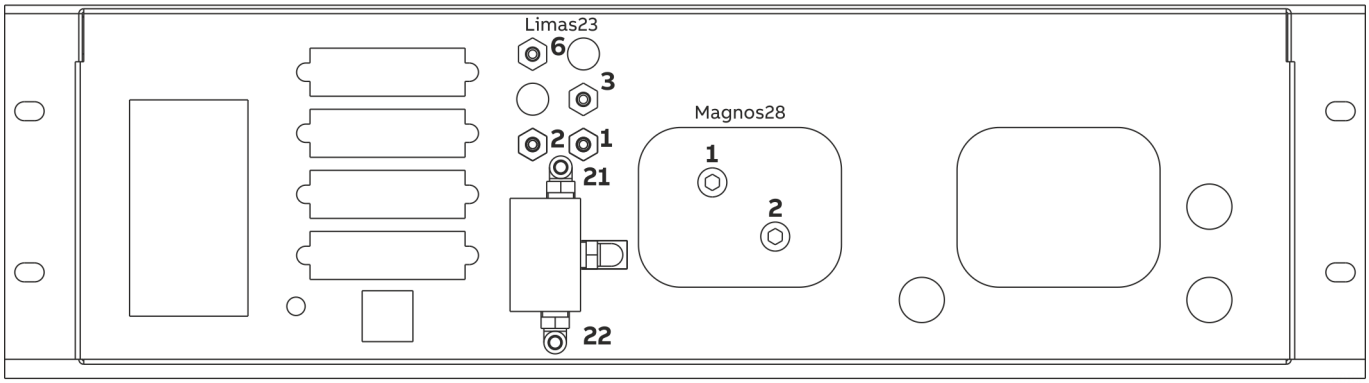


Figure 16: Gas connections Limas23 with Magnos28 (model EL3020)

Limas23: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	Without optional solenoid valve	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas outlet	—	
3	Sample gas outlet	With optional solenoid valve, factory-connected to sample gas inlet Pos. **1**	
6	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	
21	Sample gas inlet	With optional solenoid valve	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet		

Note

- The oxygen sensor is not possible in combination with Magnos28
- The pressure sensor (default, not used with the "pressure sensor outwards" option is internally connected at the output of the sample cell.

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)

Note

The sample gas inlet of Magnos28 can be connected to the sample gas output of Limas23 at the factory or have a separate sample gas path without connection to Limas23.

Gas connections Limas23 with Magnos28 (model EL3040)

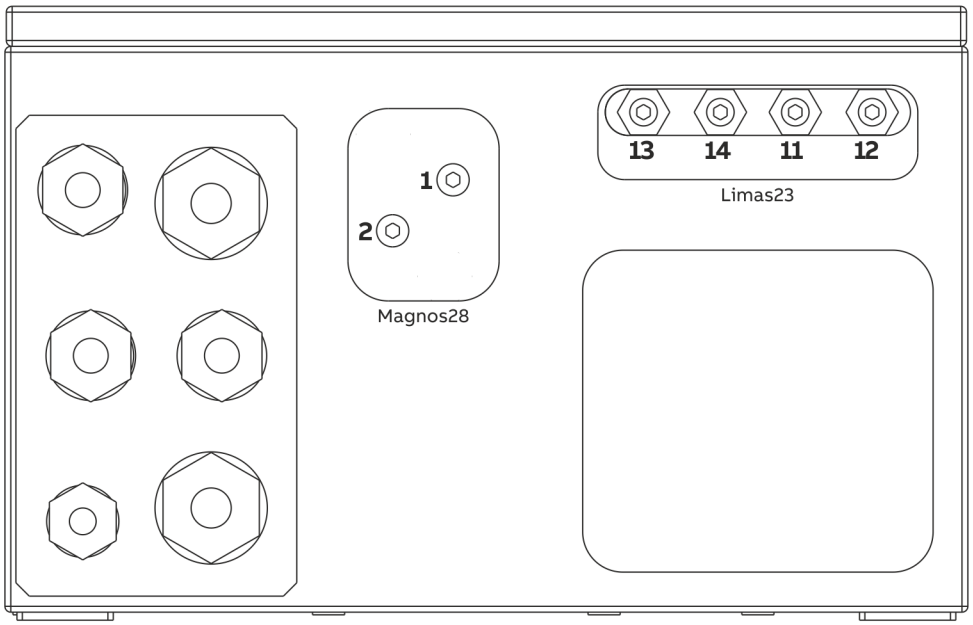


Figure 17: Gas connections Limas23 with Magnos28 (model EL3040)

Limas23: Gas connections

Pos.	Connection	Supplementary information	Design
13	Sample gas inlet	—	⅛-NPT internal thread
14	Sample gas outlet	—	(stainless steel 1.4305)
11	Pressure sensor	For ‘Pressure sensor connected to the outside by hose’ option	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
	Purge gas inlet (housing)	Not for ‘Pressure sensor connected to the outside by hose’ option	• Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
12	Purge gas outlet (housing)		

Note

- The oxygen sensor is not possible in combination with Magnos28
- The pressure sensor (default, not used with the "pressure sensor outwards" option is internally connected at the output of the sample cell.

… Gas connections

… Gas connections Limas23 with Magnos28 (model EL3040)

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	Sample gas outlet	—	

Note
The sample gas inlet of Magnos28 can be connected to the sample gas output of Limas23 at the factory or have a separate sample gas path without connection to Limas23.

Gas connections Magnos28 (model EL3020)

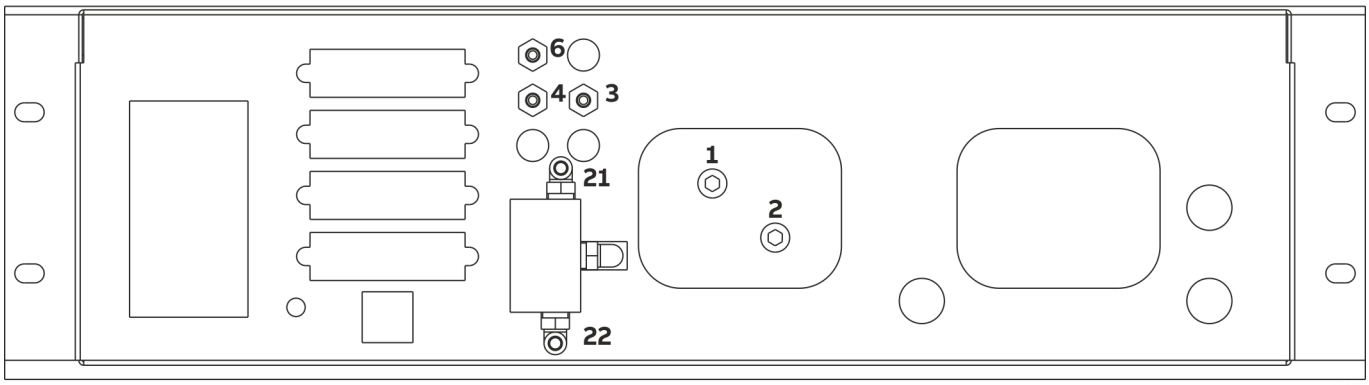


Figure 18: Gas connections Magnos28 (model EL3020)

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
3	Sample gas outlet	For 'Integrated gas feed' option, factory-connected to sample gas inlet Pos. **1**	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
4	Sample gas inlet	For 'Integrated gas feed' option with flow sensor only (without solenoid valve)	
6	Pressure sensor	—	
21	Sample gas inlet	On solenoid valve with 'integral gas feed' option with solenoid valve, pump, filter, capillary and flow sensor	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet		

Note

The pressure sensor (see **Pressure sensor** on page 31) is installed as an option.
For a precise pressure correction as well as for measurements in suppressed measuring ranges, the sensor and sample gas outlet have to be connected to each other via a T-piece and with the use of short conductors.
The lines must be as short as possible or – in the case of a greater length – have a sufficiently large inside diameter (min. 10 mm) so that the flow effect is minimized.

… Gas connections

Gas connections Magnos28 with Magnos28 (model EL3020)

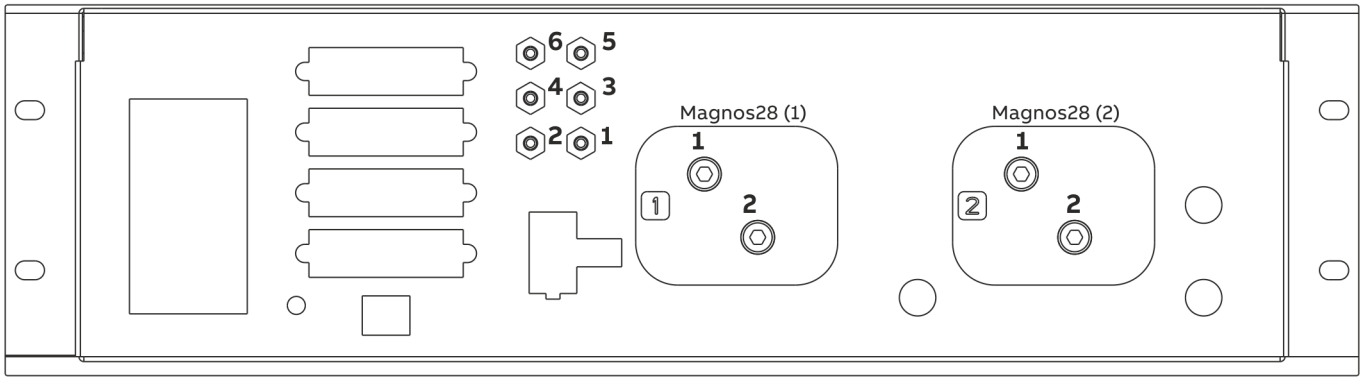


Figure 19: Gas connections Magnos28 with Magnos28 (model EL3020)

Magnos28 – gas connections for direct connection (applies to both analyzer modules)

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛ NPT internal thread
2	Sample gas outlet	—	(stainless steel 1.4305) Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
5	Pressure sensor (option)	For analyzer module (2), not for flammable sample gases	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
6	Pressure sensor (option)	For analyzer module (1). For flammable sample gases: Shared sensor for analyzer module (1) and analyzer module (2). **Caution** Do not connect the pressure sensor in the sample gas path!	

Magnos28 with Magnos28 – gas connections with ‘Integral gas feed’ option with flow sensor

Pos.	Connection	Supplementary information	Design
1	Sample gas output (gas path 1 / module 1)	Factory-connected to analyzer module (1) sample gas inlet **1**	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas inlet (gas path 1 / module 1)	—	
3	Sample gas output (gas path 2 / module 2)	Factory-connected to analyzer module (2) sample gas inlet **1**	
4	Sample gas inlet (gas path 2 / module 2)	—	
5	Pressure sensor (option)	For analyzer module (2)	
6	Pressure sensor (option)	For analyzer module (1)	

Gas connections Magnos28 with Caldos27 (model EL3020)

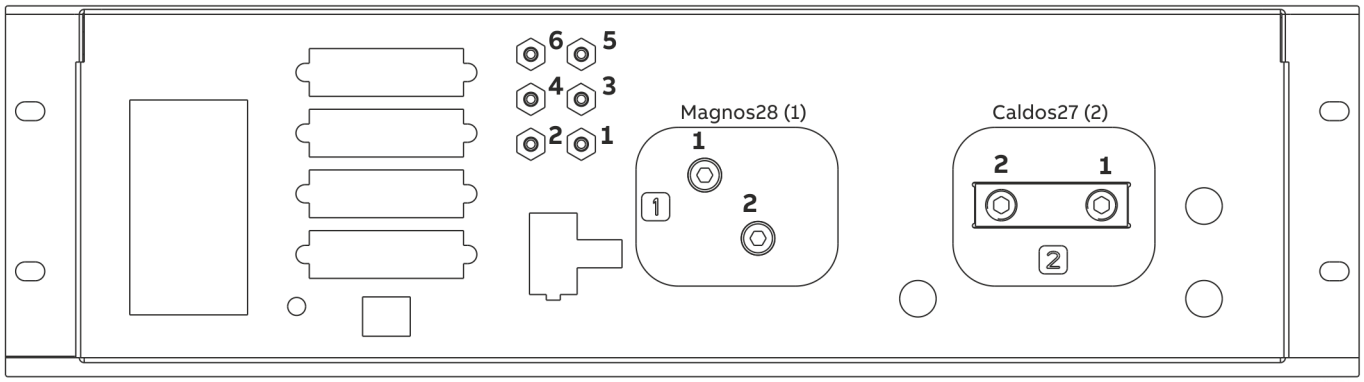


Figure 20: Gas connections Magnos28 with Caldos27 (model EL3020)

Magnos28 – gas connections for direct connection

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread
2	Sample gas outlet	—	(stainless steel 1.4305) Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
6	Pressure sensor (option)	For flammable sample gases: shared sensor for Magnos28 and Caldos27. **Caution** Do not connect the pressure sensor in the sample gas path!	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)

Caldos27 – gas connections for direct connection

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread
2	Sample gas outlet	—	(stainless steel 1.4305)
5	Pressure sensor	Not for flammable sample gases	Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
6	Pressure sensor	For flammable sample gases: shared sensor for Magnos28 and Caldos27. **Caution** Do not connect the pressure sensor in the sample gas path!	

… Gas connections

… Gas connections Magnos28 with Caldos27 (model EL3020)

Magnos28 with Caldos27 – gas connections for 'Integral gas feed' option with flow sensor

Pos.	Connection	Supplementary information	Design
1	Sample gas outlet (gas path 1 / Magnos28)	Factory-connected to Magnos28 sample gas inlet **1**	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas inlet (gas path 1 / Magnos28)	—	
3	Sample gas outlet (gas path 2 / Caldos27)	Factory-connected to Caldos27 sample gas inlet **1**	
4	Sample gas inlet (gas path 2 / Caldos27)	—	
5	Pressure sensor	For Caldos27	
6	Pressure sensor (option)	For Magnos28	

Gas connections Magnos28 (model EL3040)

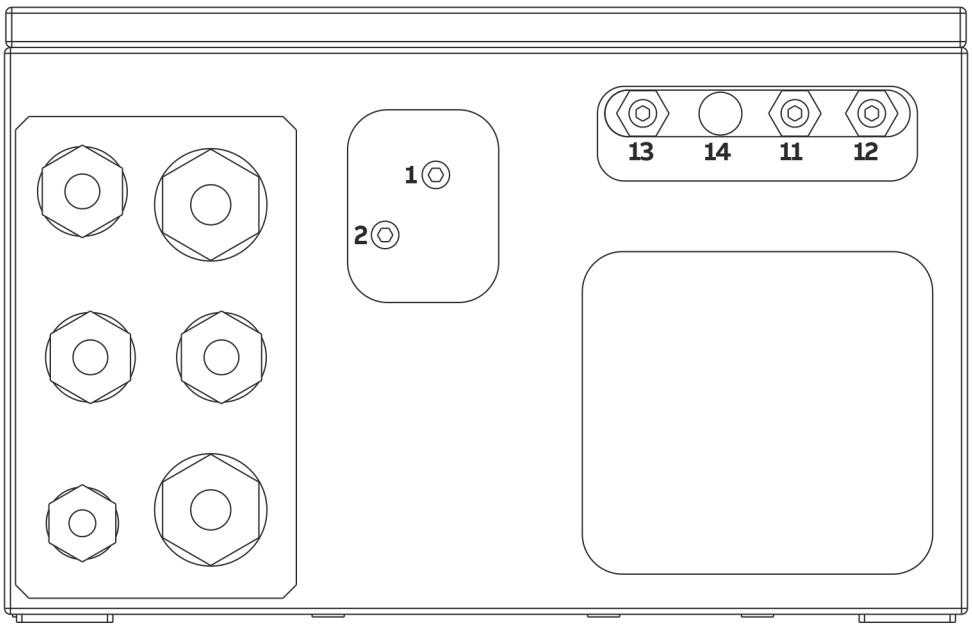


Figure 21: Gas connections Magnos28 (model EL3040)

Magnos28: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305) • Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
2	Sample gas outlet	—	
11	Purge gas inlet (housing)	—	
12	Purge gas outlet (housing)	—	
13	Pressure sensor	—	
14	not used	—	

Note

The pressure sensor (see **Pressure sensor** on page 31) is installed as an option.
For a precise pressure correction as well as for measurements in suppressed measuring ranges, the sensor and sample gas outlet have to be connected to each other via a T-piece and with the use of short conductors.
The lines must be as short as possible or – in the case of a greater length – have a sufficiently large inside diameter (min. 10 mm) so that the flow effect is minimized.

… Gas connections

Gas connections Magnos27 (model EL3020)

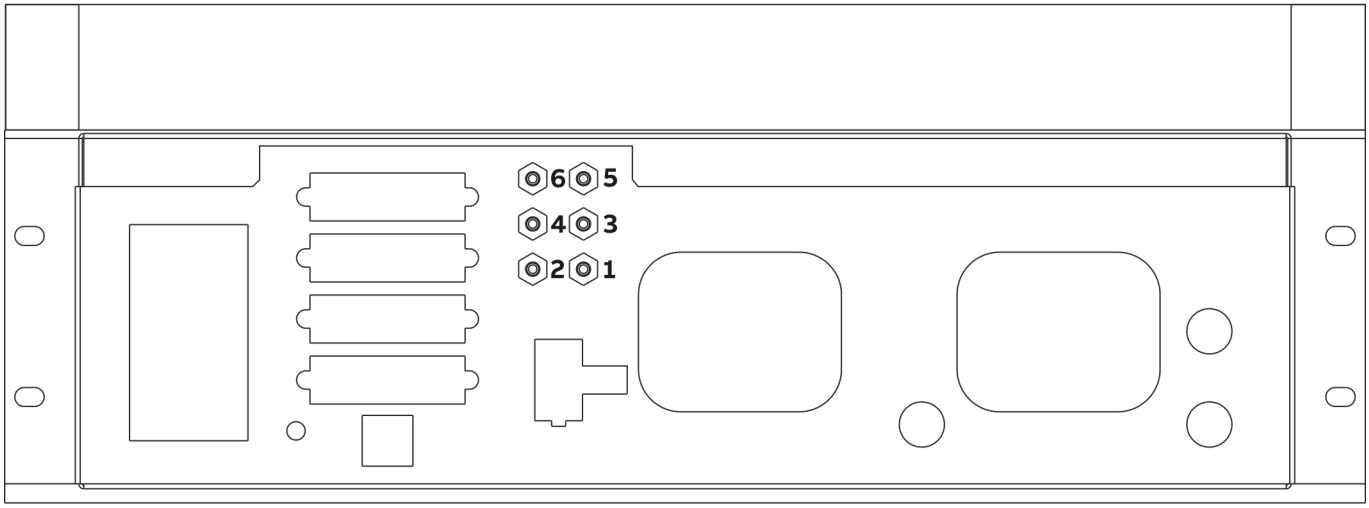


Figure 22: Gas connections Magnos27 (model EL3020)

Magnos27: Gas connections

Pos.	Connection	Supplementary information	Design
1	Pressure sensor	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	not used	—	
3	Sample gas inlet	—	
4	Sample gas outlet	—	
5	Purge gas inlet analyzer	—	
6	Purge gas outlet analyzer	—	

Note

The pressure sensor (see **Pressure sensor** on page 31) is installed as an option.

For a precise pressure correction as well as for measurements in suppressed measuring ranges, the sensor and sample gas outlet have to be connected to each other via a T-piece and with the use of short conductors.

The lines must be as short as possible or – in the case of a greater length – have a sufficiently large inside diameter (min. 10 mm) so that the flow effect is minimized.

Gas connections Magnos27 with Uras26 (model EL3020)

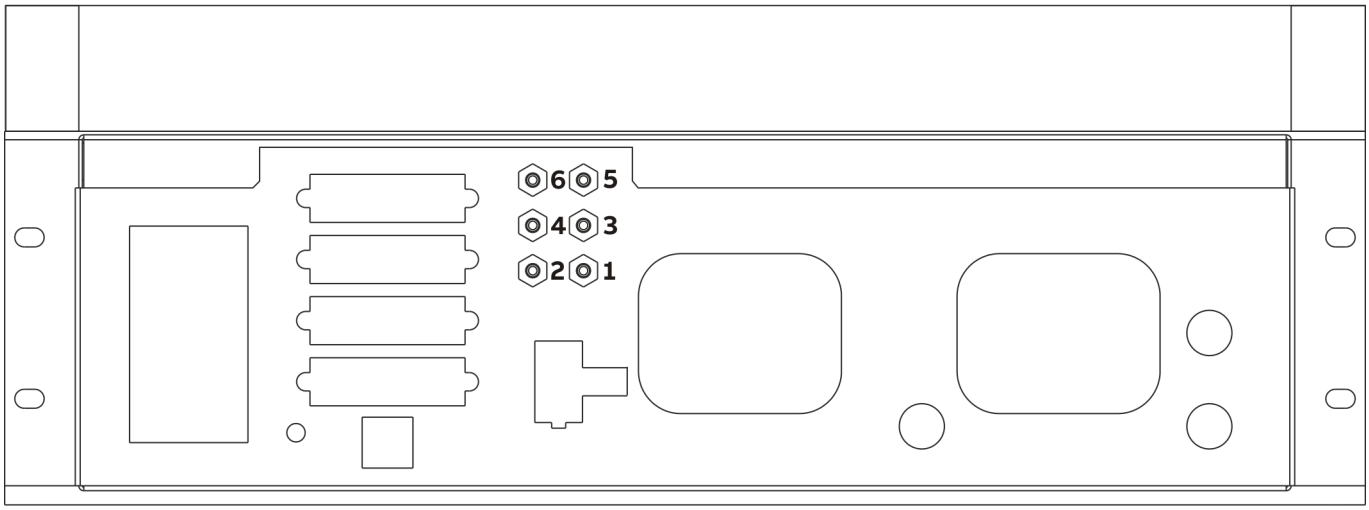


Figure 23: Gas connections Magnos27 with Uras26 (model EL3020)

Magnos27: Gas connections

Pos.	Connection	Supplementary information	Design
3	Sample gas inlet	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
4	Sample gas outlet	—	
5	Purge gas inlet analyzer	Not for the 'pressure sensor connected to the outside by hose' option, not in combination with Uras26 with two cells and separate gas paths	
6	Purge gas outlet analyzer		
	Pressure sensor	For the 'pressure sensor connected to the outside by hose' option, not in combination with Uras26 with two cells and separate gas paths	

Uras26: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet (gas path 1)	—	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas outlet (gas path 1)	—	
5	Sample gas outlet (gas path 2)	For optional second sample gas for Uras26 with two cells and separate gas paths	
6	Sample gas inlet (gas path 2)		

Note

The pressure sensor (standard, not for the 'pressure sensor connected to outside by hose' option) is internally connected as follows:

- In the output of the sample cell 1, for a sample cell and for two sample cells with separate gas paths.
- In the output of sample cell 2 for two sample cells in series.

… Gas connections

Gas connections ZO23 (model EL3020)

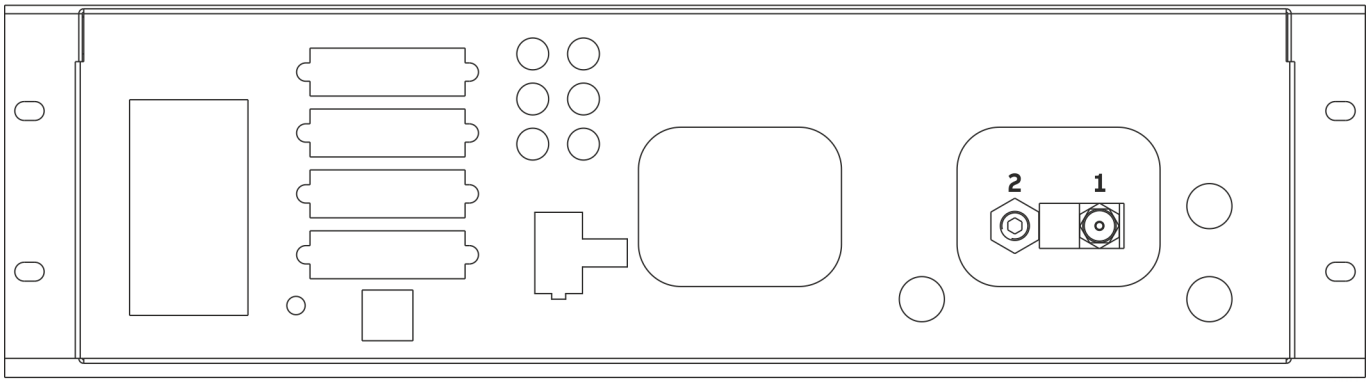


Figure 24: Gas connections ZO23 (model EL3020)

ZO23: Gas connections

The measuring chamber is connected to the sample gas inlet connection via a stainless steel pipe and to the sample gas outlet connection via an FPM hose.

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	3 mm Swagelok®
2	Sample gas outlet	—	⅛ NPT female thread for threaded connections (not included in scope of supply)

Gas connections ZO23 (model EL3040)

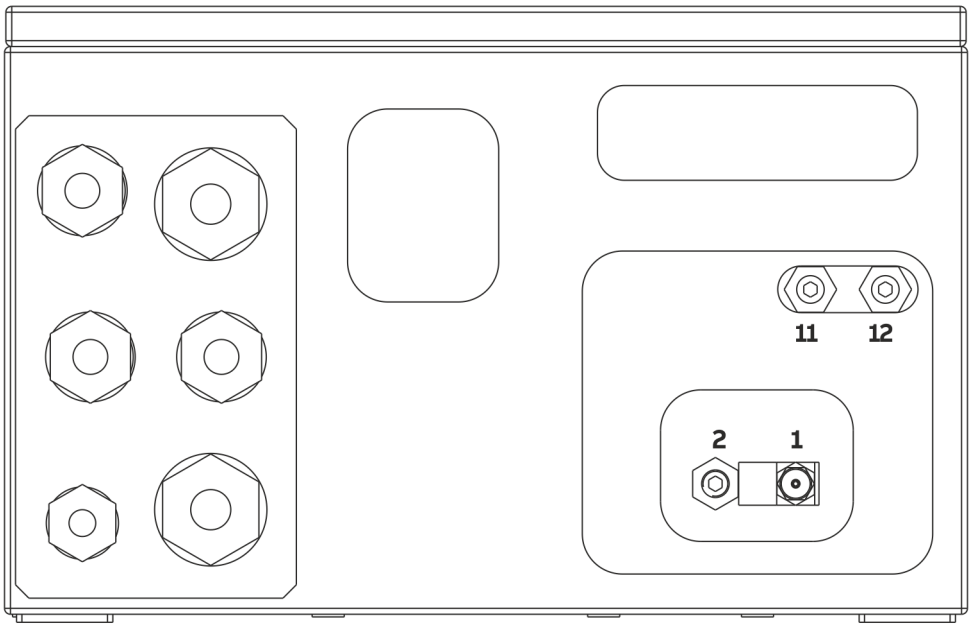


Figure 25: Gas connections ZO23 (model EL3040)

ZO23: Gas connections

The measuring chamber is connected to the sample gas inlet connection via a stainless steel pipe and to the sample gas outlet connection via an FPM hose.

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	3 mm Swagelok®
2	Sample gas outlet	—	⅛ NPT female thread for threaded connections
11	Purge gas inlet (housing)	—	(not included in scope of supply)
12	Purge gas outlet (housing)	—	

… Gas connections

Gas connections Caldos27 (model EL3020)

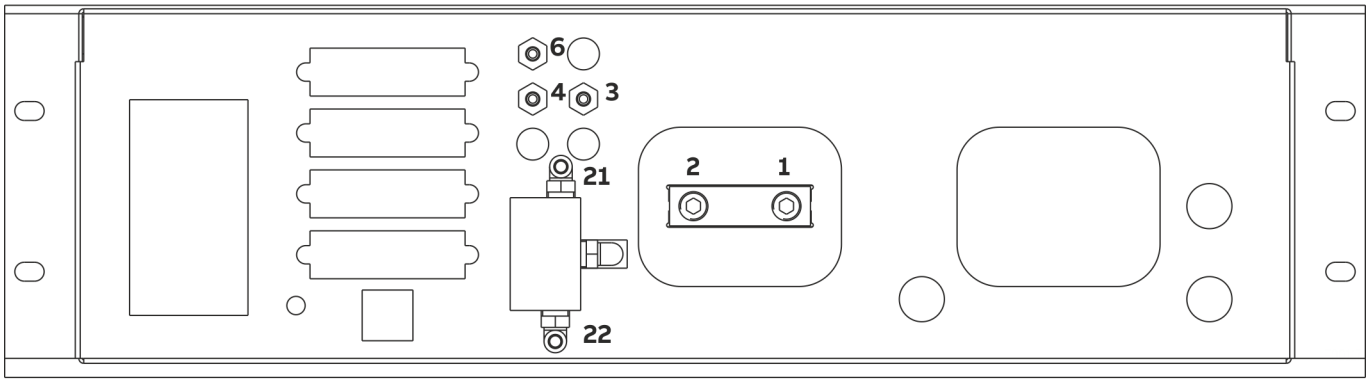


Figure 26: Gas connections Caldos27 (model EL3020)

Caldos27: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery) • Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
3	Sample gas outlet	For ‘Integrated gas feed’ option, factory-connected to **1** sample gas inlet	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
4	Sample gas inlet	For ‘Integrated gas feed’ option with flow sensor only (without solenoid valve)	
6	Pressure sensor	—	
21	Sample gas inlet	On solenoid valve with ‘integral gas feed’ option with solenoid valve, pump, filter, capillary and flow sensor	Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inside diameter (included in scope of supply)
22	Test gas inlet		

Gas connections Caldos27 with Caldos27 (model EL3020)

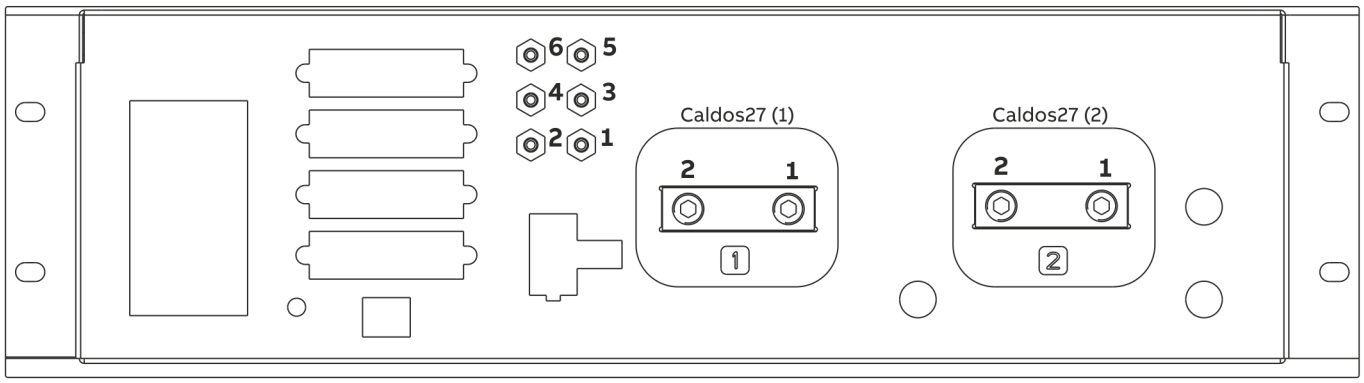


Figure 27: Gas connections Caldos27 with Caldos27 (model EL3020)

Caldos27 – gas connections for direct connection (applicable for both analyzer modules)

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛-NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
5	Pressure sensor	For analyzer module (2), not for flammable sample gases	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
6	Pressure sensor	For analyzer module (1), for flammable sample gases: Shared sensor for analyzer module (1) and analyzer module (2). **Caution** Do not connect the pressure sensor in the sample gas path!	

Caldos27 with Caldos27 – gas connections for 'Integral gas feed' option with flow sensor

Pos.	Connection	Supplementary information	Design
1	Sample gas output (gas path 1 / module 1)	Factory-connected to analyzer module (1) sample gas inlet **1**	Screwed fittings with hose nozzles (made of stainless steel 1.4305) for hoses with 4 mm internal diameter (included in the delivery)
2	Sample gas inlet (gas path 1 / module 1)	—	
3	Sample gas output (gas path 2 / module 2)	Factory-connected to analyzer module (2) sample gas inlet **1**	
4	Sample gas inlet (gas path 2 / module 2)	—	
5	Pressure sensor	For analyzer module (2)	
6	Pressure sensor	For analyzer module (1)	

… Gas connections

Gas connections Caldos27 (model EL3040)

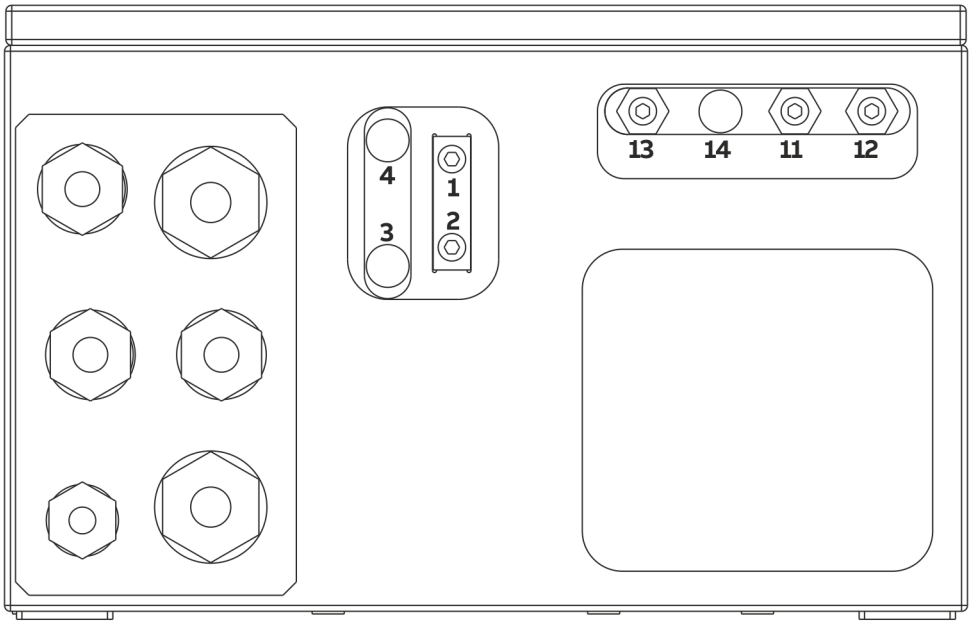


Figure 28: Gas connections Caldos27 (model EL3040)

Caldos27: Gas connections

Pos.	Connection	Supplementary information	Design
1	Sample gas inlet	—	⅛ NPT internal thread (stainless steel 1.4305)
2	Sample gas outlet	—	
3	not used	—	• Connection of hose lines: Straight screw-in socket (PP) with hose nozzles for hoses with inside diameter 4 mm (included in scope of delivery)
4	not used	—	
11	Purge gas inlet (housing)	—	
12	Purge gas outlet (housing)	—	
13	Pressure sensor	—	• Connection of pipelines: Screw-in fittings (not included in the scope of delivery)
14	not used	—	

Gas connections and electrical connections Fidas24 (model EL3020)

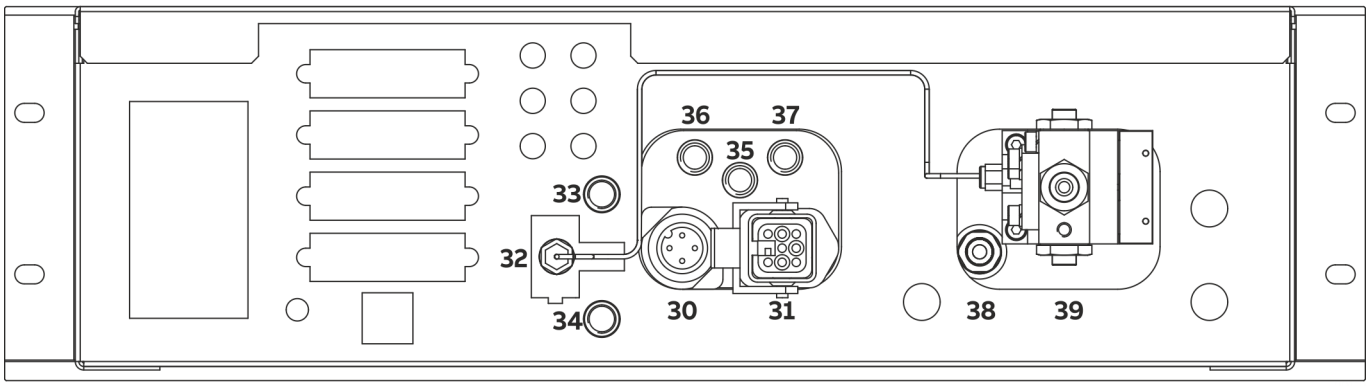


Figure 29: Gas connections and electrical connections Fidas24 (model EL3020)

Fidas24: Gas and electrical connections

Pos.	Connection	Supplementary information	Design
30	Power supply (input)	115 V AC or 230 V AC for heating the detector and sample gas inlet	4-pin male connector, connection cable included in scope of supply
31	Power supply (output)	Electrical connection to the heated sample gas connection	Permanently connected
32	Test gas outlet	—	⅛ NPT female thread for threaded connections (not included in scope of supply)
33	Zero-point gas inlet	—	
34	End-point gas inlet	—	
35	Combustion air inlet	—	
36	Combustion gas inlet	—	
37	Instrument air inlet	—	
38	Exhaust outlet	—	External thread for connecting the exhaust air pipe (stainless steel pipe with an external diameter of 6 mm, included in the delivery of the gas analyzer)
39	Sample gas inlet	Heated or unheated	Fitting for PTFE or stainless steel pipes with an external diameter of 6 mm

… Gas connections

Gas connections and electrical connections Fidas24 (model EL3040)

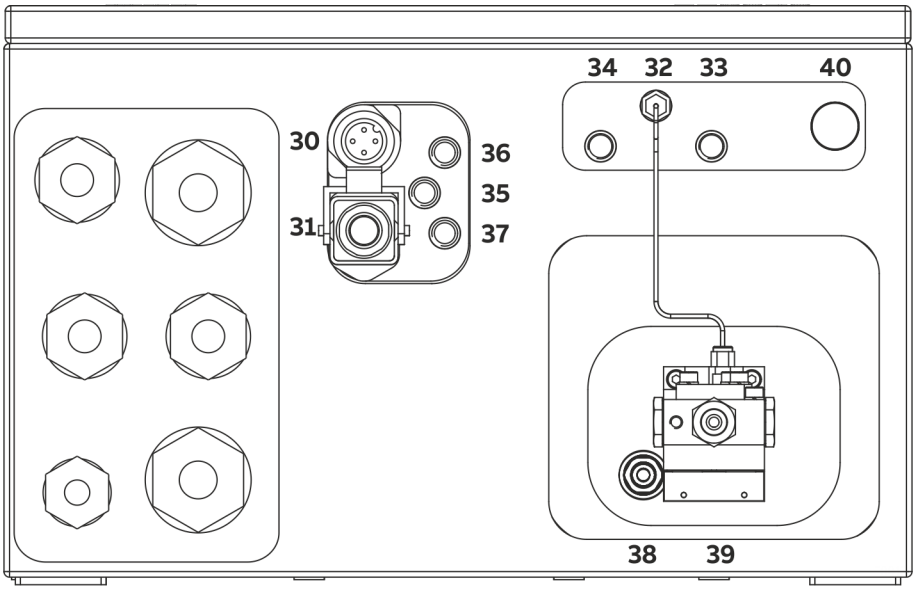


Figure 30: Gas connections and electrical connections Fidas24 (model EL3040)

Fidas24: Gas and electrical connections

Pos.	Connection	Supplementary information	Design
30	Power supply (input)	115 V AC or 230 V AC for heating the detector and sample gas inlet	4-pin male connector, connection cable included in scope of supply
31	Power supply (output)	Electrical connection to the heated sample gas connection	Permanently connected
32	Test gas outlet	—	⅛ NPT female thread for threaded connections (not included in scope of supply)
33	Zero-point gas inlet	—	
34	End-point gas inlet	—	
35	Combustion air inlet	—	
36	Combustion gas inlet	—	
37	Instrument air inlet	—	
38	Exhaust outlet	—	External thread for connecting the exhaust air pipe (stainless steel pipe with an external diameter of 6 mm, included in the delivery of the gas analyzer)
39	Sample gas inlet	Heated or unheated	Fitting for PTFE or stainless steel pipes with an external diameter of 6 mm
40	Pressure equalizing opening	With protective filter (the protective filter must be protected against humidity)	—

Note

With the IP54 version of the Fidas24, the operator must ensure the IP protection class of the housing by taking additional design measures at the pressure equalization opening.

Dimensions

19” housing (model EL3020)

19” housing (model EL3020)

Dimensions in mm (in)

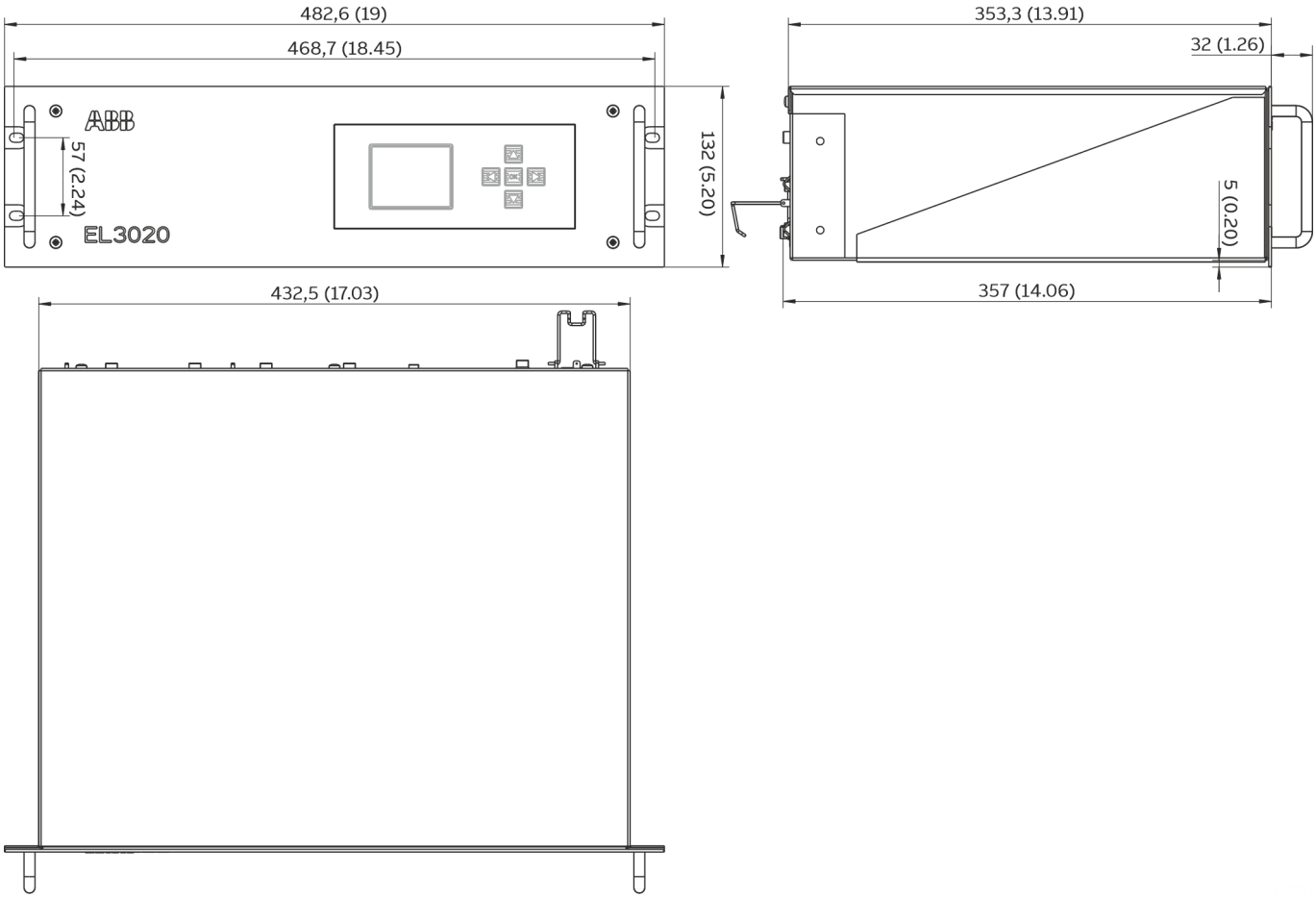


Figure 31: 19” housing (model EL3020)

19” housing (model EL3020 with Magnos27)

Dimensions in mm (in)

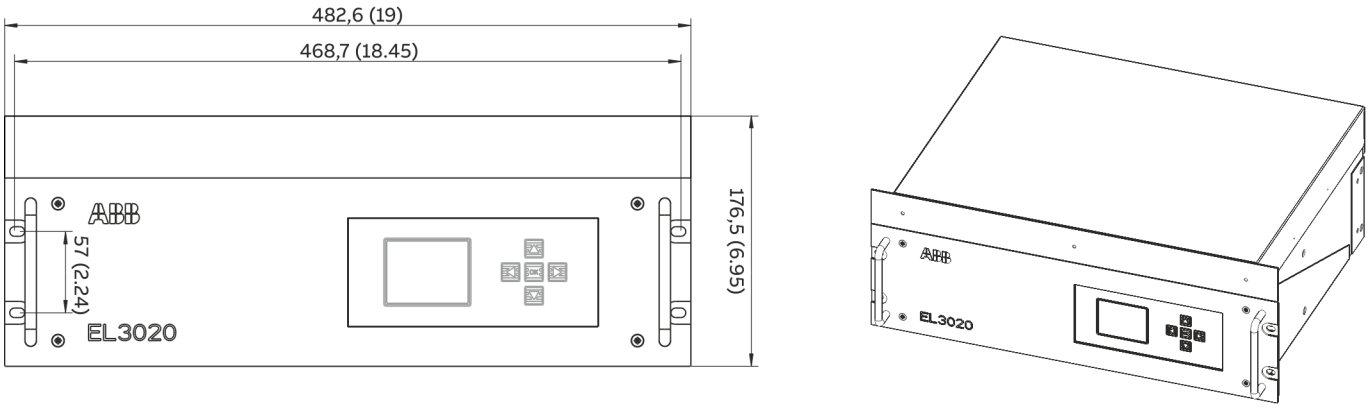


Figure 32: 19”housing (model EL3020 with Magnos27)

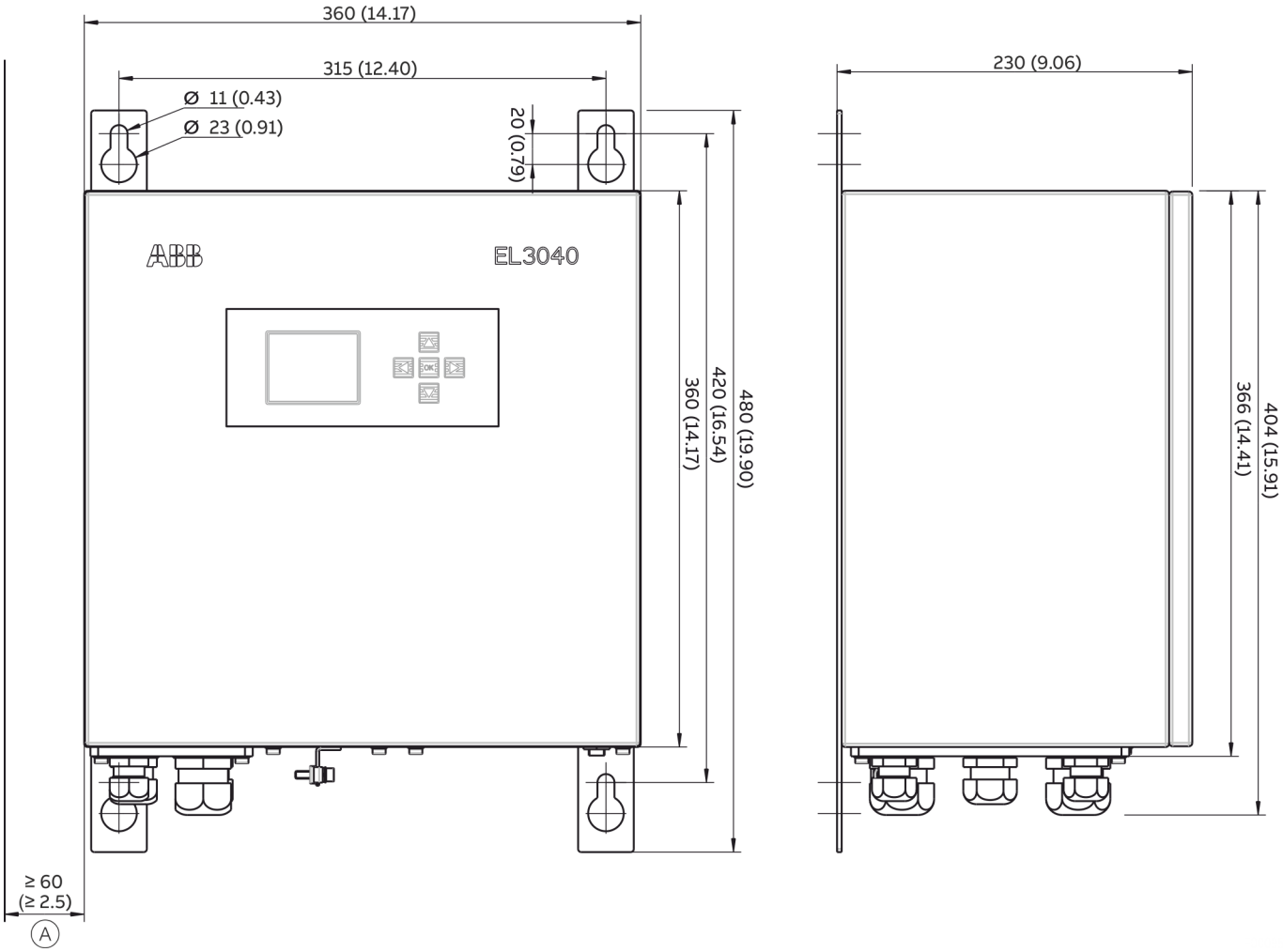
Note

Only the front view of the housing (with its height differing from the standard dimension) is depicted in this dimensional drawing. Additional views and dimensions of the 19” housing are shown in **Figure 31**.

… Dimensions

Wall-mount housing (model EL3040)

Wall-mount housing (model EL3040)
Dimensions in mm (in)



Ⓐ Consider free space to swivel the door

Figure 33: Wall-mount housing (model EL3040)

Approvals, tests and certificates

Performance tests

Uras26, electrochemical oxygen sensor
The gas analyzers of the EL3000 series Uras26 (measuring components CO, NO, SO_2, CO_2, N_2O), and electrochemical oxygen sensor (measuring component O_2) are suited for use in plants that require approval (13th BImSchV, 17th BImSchV, 30th BImSchV, TA-Luft) as well as in the annexes of the 27th BImSchV.

The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.

- Report no. 691317 dated 6/30/2006; Announcement: BAnz of 10/14/2006, No. 194, page 6715.
- Report no. 1669640 dated 9/30/2011; Announcement: BAnz of 3/2/2012, No. 36, page 925.
- Report no. 936/21217137/B dated 10/14/2011; Announcement: BAnz of 03/02/2012, No. 36, page 924.

Uras26, Magnos28, electrochemical oxygen sensor
The EL3000 Series gas analyzers Uras26 (sample components CO, NO, NOx, SO_2, N_2O, CO_2), Magnos28 (sample component O_2) and electrochemical oxygen sensor (sample component O_2) meet the requirements of the 'MCERTS Performance Standards for Continuous Emission Monitoring Systems, Version 3.5 dated June 2016', EN 15267-3:2007 and QAL 1 in accordance with EN 14181:2014.
Certificate no. Sira MC080122/13 of 8/18/2017

Limas23
The gas analyzers of the EL3000 series Limas23 (measuring components NO, NO_2, SO_2), and electrochemical oxygen sensor (measuring component O_2) are suited for use in plants that require approval (13th BImSchV and 17 BImSchV) as well as in TA-Luft systems.

The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.

- Report no. 2231669.2 dated 9/30/2015; Announcement: BAnz AT of 3/14/2016, No. B7, page 3.

Fidas24
The gas analyzer of the EL3000 series Fidas24 (measuring component Total-C) is suited for use in systems that require approval (13th BImSchV, 17th BImSchV, 30th BImSchV, TA-Luft) as well as in the annexes of the 27th BImSchV.
The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.

- Report no. 936/2123 1/A dated 2/29/2016; Announcement: BAnz AT of 8/1/2016, No. B11, page 2.

CE conformity

The EL3000 series gas analyzers satisfy the requirements of the European directives:

- 2014/35/EU Low Voltage Directive,
- 2014/30/EU EMC Directive
- 2014/34/EU ATEX Directive (only version in category 3G for measuring non-flammable gases and vapors)
- 2011/65/EU RoHS Directive

Explosion protection according to European standards

Model EL3040 gas analyzers with Uras26, Magnos28, Caldos27 and oxygen sensor in category 3G for measurement of flammable and non-flammable gases satisfy the requirements of European standards:

- EN 60079-0:2012+A11:2013
- EN 60079-15:2010

Marking:
Ⓔx II 3G Ex nA nC IIC T4 Gc

Type examination certificate no. .
BVS 16 ATEX E 085 X

Approval for USA and Canada – CSA

The EL3000 series gas analyzers are certified for use in 'general purpose' environments, evidenced by full compliance with standards CAN/CSA-C22.2 no. 61010-1-12 and UL Std. No. 61010-1 (Third Edition).

Certificate No. 70012655

Approval for the customs union of Russia, Belarus and Kazakhstan – GOST TR CU

The EL3000 Series gas analyzers are certified for use in general purpose environment.

- GOST TR CU Certificate: No. TC N RU Д-DE.AB72.B.02310
- Metrological certificate for Russia: No. DE.C.31.004.A No. 37984

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Notes

Notes

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