EasyLine EL3000 Series
Continuous gas analyzers
Measurement made easy
So smart, they’re simple

A wide variety of measurement technology
- Detectors for multiple process and emission monitoring applications
- Up to five sample components in one gas analyzer
- Suitable for measuring flammable gases
- Version in Category 3G for measuring non-flammable gases
- Performance-tested for emission monitoring according to EN 15267
- QAL3 monitoring according to EN 14181 (optional)

Straightforward handling
- Automatic calibration including control of pump and solenoid 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-inch rack mounting or wall mounting
- Integrated pneumatics module in model EL3020 (optional)
- Ethernet, Modbus and PROFIBUS interfaces
- Configurable analog outputs and digital inputs/outputs

User-friendly operation
- Simple operator interface
- Clear-text status messages
- Configuration of seldom required functions with configuration software
Overview of the gas analyzers

Measuring technology (analyzers)
The following analyzers are available for selection:
- Uras26 infrared photometer for the measurement of infrared-active gas components, e.g. CO, NO, SO2
- Limas23 ultraviolet photometer for the measurement of NO, NO2 and SO2
- Magnos206 oxygen analyzer for the measurement of O2 in process gas or in N2
- Magnos28 oxygen analyzer for the measurement of O2 in process gas or in N2
- ZO23 trace oxygen analyzer for the measurement of O2 in flue gas or in N2
- Fidas24 flame-ionization detector for the measurement of hydrocarbons
- Electronical oxygen sensor for the measurement of O2

The following analyzers can also be used in combination with Uras26 or Limas23:
- Magnos27 and Caldos27 can also be used in combination with Uras26.
- Fidas24 and ZO23 cannot be used in combination with one of the other analyzers.

The electrochemical oxygen sensor can only be used in combination with Uras26 or Limas23. Two electrochemical oxygen sensors can be used in combination with Uras26 with separate gas paths (only in model EL3020).

Each analyzer has one physical measurement range per sample component. A section of the physical measurement range can be mapped to the current output (analog output) by on-site configuration. Calibration is always executed in the physical measurement range. The permissible measurement range limits are given by the specification of the smallest and largest measurement ranges for the individual analyzers. A total of up to five measurement components can be measured with one gas analyzer.

Calibration
Calibration can be performed automatically or manually 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 the control of solenoid valves for switching on five test gases, zero gas and sample gas via digital outputs can be configured.

Concept of operation
The functions required in normal operation are operated and configured directly on the gas analyzer.

The functions which are only seldom required, e.g. during start-up, are configured offline using the configuration software ECT (“EasyLine Configuration Tool” on the enclosed DVD-ROM) and then loaded into the gas analyzer.

QAL3 monitoring
QAL3 monitoring is available as an option in the gas analyzer. It is used to fulfill the requirements according to EN 14181 for storage and analysis of device adjustment data. The QAL3 monitoring option features the following functions:
- Automatic acquisition, verification and documentation of drift and precision at zero and reference points
- Reporting via CUSUM and Shewhart control charts
- QAL3 data storage in the gas analyzer (maximum 1 year)
- QAL3 data display and read-out as well as parameter setting via web browser
- Status messages on deviations beyond requirements
- Data export for further processing with spreadsheet programs

Electrical interfaces
The electrical interfaces for the output of measured values and communication with external systems include:
- The integrated Ethernet-10/100BASE-T interface for
  - gas analyzer configuration with configuration software ECT
  - QAL3 data transfer if the QAL3 monitoring option is integrated in the gas analyzer
  - data transmission with Modbus TCP/IP protocol (measured values, status signals and 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 according to VDI 4201 Part 2),
- Modbus module with one RS485 and one RS232 interface (also according to VDI 4201 Part 3),
- Digital I/O module with four digital inputs and four digital outputs,
- 2-way analog output module with two analog outputs,
- 4-way analog output module with four analog outputs.

Integral gas feed
The integral gas feed (optional in model EL3020) is available in two versions. It includes:
- either the solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
- or a flow sensor module.

Housing design
The housing for the EL3020 gas analyzer model is designed as 19-inch housing with 3 height units (4 height units with Magnos27) and degree of protection IP20 (IP40 with version for emission monitoring).

The housing for the EL3040 gas analyzer model is designed as wall-mount housing with degree of protection IP65.
Infrared photometer Uras26

Measurement principle
Non-dispersive infrared absorption
Photometer with 1 or 2 beam paths (gas paths) to measure up to 4 components

Sample components and measurement ranges

<table>
<thead>
<tr>
<th>Sample component</th>
<th>Smallest measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0–100 ppm</td>
</tr>
<tr>
<td>CO₂</td>
<td>0–100 ppm</td>
</tr>
<tr>
<td>NO</td>
<td>0–150 ppm</td>
</tr>
<tr>
<td>SO₂</td>
<td>0–100 ppm</td>
</tr>
<tr>
<td>N₂O</td>
<td>0–100 ppm</td>
</tr>
<tr>
<td>CH₄</td>
<td>0–100 ppm</td>
</tr>
</tbody>
</table>

Measurement range quantity
2 measurement ranges

Measurement range limits

<table>
<thead>
<tr>
<th>Smallest measurement range</th>
<th>Largest measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–100 ppm (NO: 0–150 ppm)</td>
<td>0–500 ppm (NO: 0–750 ppm)</td>
</tr>
<tr>
<td>0–200 ppm</td>
<td>0–1000 ppm</td>
</tr>
<tr>
<td>0–600 ppm</td>
<td>0–3000 ppm</td>
</tr>
<tr>
<td>0–2000 ppm</td>
<td>0–10000 ppm</td>
</tr>
<tr>
<td>0–0.6 vol.%</td>
<td>0–3 vol.%</td>
</tr>
<tr>
<td>0–2 vol.%</td>
<td>0–10 vol.%</td>
</tr>
<tr>
<td>0–6 vol.%</td>
<td>0–30 vol.%</td>
</tr>
<tr>
<td>0–20 vol.%</td>
<td>0–100 vol.%</td>
</tr>
</tbody>
</table>

An individual measurement range within the limits shown in the table can be factory-set on special order.
Measurement ranges are freely adjustable within the limits shown in the table.
Measurement ranges should not be set within ignition limits.

Version for use in air separation units

Only for binary gas mixtures consisting of the sample component in Ar, N₂ or O₂

<table>
<thead>
<tr>
<th>Sample component</th>
<th>Smallest/Largest measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>0–10 ppm / 0–50 ppm</td>
</tr>
<tr>
<td>CO₂</td>
<td>0–5 ppm / 0–25 ppm</td>
</tr>
<tr>
<td>N₂O</td>
<td>0–10 ppm / 0–50 ppm</td>
</tr>
<tr>
<td>CH₄</td>
<td>0–20 ppm / 0–100 ppm</td>
</tr>
</tbody>
</table>

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
Sensitivity drift: ≤ 1 % per week
Output fluctuation (2 o): ≤ 0.5 % at T90 = 15 sec

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

Linearity deviation
≤ 1 % of span

Repeatability
≤ 0.5 % of span

Zero drift
≤ 1 % of span per week

Sensitivity drift
≤ 1 % of measured value per week

Output fluctuation (2 o)
≤ 0.2 % of span at electronic T90 time (static/dynamic) = 5/0 sec

Detection limit (4 o)
≤ 0.4 % of span at electronic T90 time (static/dynamic) = 5/0 sec

Influence effects

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

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

Temperature effect
Ambient temperature in permissible range
– At zero-point: ≤ 2 % of span per 10 °C
– On sensitivity without thermostat:
  ≤ 3 % of measured value per 10 °C
– On sensitivity with thermostat (optional):
  ≤ 2 % of measured value per 10 °C

Thermostat temperature = 55 °C

Air pressure effect
– At zero-point: No effect

On sensitivity with pressure correction by means of integral pressure sensor: ≤ 0.2 % of measured value per 1 % barometric pressure change

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

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

**90% response time**
T90 ≤ 2.5 sec for sample gas flow = 60 l/h and electronic T90 time (static/dynamic) = 5/0 sec

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

**Materials in contact with the sample medium**

**Analyzer (sample cells)**
Tubing: aluminum; windows: CaF2 or BaF2; connectors: stainless steel 1.4305 (SAE 303)

**Gas lines and connectors**
Gas lines: FPM hoses or PTFE tubes; connectors: stainless steel 1.4305 (SAE 303); solenoid valve (option in model EL3020): PVDF. When flammable components are present in the sample gas: Gas lines: stainless steel tubes 1.4571 (SAE 316Ti); connectors: stainless steel 1.4305 (SAE 303).

**Sample gas inlet conditions**

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

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

**Pressure**
The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request. Overpressure in the sample cell max. 500 hPa.

**Flow rate**
20–100 l/h

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

**Flammable gases**
In the version with gas lines and connectors made of stainless steel the analyzer is suitable for measuring flammable gases in general purpose environment (see page 22).

**Gas connections**
See page 27 and page 28
Ultraviolet photometer Limas23

Measurement principle
UV-RAS (UV Resonance Absorption Spectroscopy) method for sample component NO,
NDUV (Non-Dispersive UV Absorption Spectroscopy) method for sample components NO₂ and SO₂
Photometer to measure up to 3 components

Sample components and measurement ranges

<table>
<thead>
<tr>
<th>Sample component</th>
<th>Smallest/Largest measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>0–50 ppm / 0–5000 ppm</td>
</tr>
<tr>
<td>NO₂</td>
<td>0–50 ppm / 0–500 ppm</td>
</tr>
<tr>
<td>SO₂</td>
<td>0–100 ppm / 0–5 vol.%</td>
</tr>
</tbody>
</table>

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

NO processed through a converter can be indicated as sample component “NOx” on the display (factory-set).
For indication of the NOx measurement value in mg/m³, the factor 1.53 is taken into account for conversion of NO to NOx (factory-set).

Measurement range quantity
2 measurement ranges

<table>
<thead>
<tr>
<th>Measurement range limits</th>
<th>Smallest measurement range</th>
<th>Largest measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–50 ppm</td>
<td>0–250 ppm</td>
<td></td>
</tr>
<tr>
<td>0–100 ppm</td>
<td>0–500 ppm</td>
<td></td>
</tr>
<tr>
<td>0–200 ppm</td>
<td>0–1000 ppm</td>
<td></td>
</tr>
<tr>
<td>0–400 ppm</td>
<td>0–2000 ppm</td>
<td></td>
</tr>
<tr>
<td>0–1000 ppm</td>
<td>0–5000 ppm</td>
<td></td>
</tr>
<tr>
<td>0–4000 ppm</td>
<td>0–20000 ppm</td>
<td></td>
</tr>
<tr>
<td>0–1 vol.%</td>
<td>0–5 vol.%</td>
<td></td>
</tr>
</tbody>
</table>

An individual measurement range within the limits shown in the table can be factory-set on special order. Measurement ranges are freely adjustable within the limits shown in the table.

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

Linearity deviation
≤ 1 % of span

Repeatability
≤ 0.5 % of span

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

Sensitivity drift
≤ 1 % of measured value per week

Output fluctuation (2σ)
≤ 0.5 % of span at electronic T90 time = 20 sec

Detection limit (4σ)
≤ 1 % of span at electronic T90 time = 20 sec

Influence effects

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

Associated gas effect/cross sensitivity
The knowledge of the sample gas composition is necessary for the analyzer configuration. Selectivity measures to reduce associated gas effect (optional): Internal adjustment or internal electronic cross-sensitivity correction for one sample component by other sample components measured with the gas analyzer.

Temperature effect
 Ambient temperature in permissible range
– At zero-point: ≤ 1 % of span per 10 °C
– On sensitivity: ≤ 1.5 % of measured value per 10 °C

Air pressure effect
– At zero-point: No effect
– On sensitivity with pressure correction by means of integral pressure sensor: ≤ 0.2 % of measured value per 1 % barometric pressure change
The pressure sensor is located in the sample gas path.

Power supply effect
Voltage and frequency in the permissible range: No effect
Dynamic response

Warm-up time
Approx. 2 hours

90% response time
\[ T_{90} \leq 3 \text{ sec for sample gas flow } = 60 \text{ l/h and electronic } T_{90} \text{ time } = 0 \text{ sec} \]

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

Materials in contact with the sample medium

Analyzer (sample cell)
Tubing: aluminum; windows: CaF\(_2\); connectors: stainless steel 1.4305 (SAE 303). Option: Tubing, windows and connectors made of quartz glass.

Gas lines and connectors
Gas lines: FPM hoses; gas connectors: stainless steel 1.4305 (SAE 303)

Gas connections
See page 29

Sample gas inlet conditions

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

Temperature
The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required. The internal temperature of the gas analyzer is at least 10 °C above ambient temperature.

Pressure
The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request. Overpressure in the sample cell max. 500 hPa.

Flow rate
20–100 l/h

Corrosive gases
Highly corrosive associated gas components, e.g. chlorine (Cl\(_2\)) and hydrogen chloride (HCl), as well as gases or aerosols containing chlorine must be cooled or undergo prior absorption.

Note
The analyzer cannot be used in combination with the integral gas feed.
Oxygen analyzer Magnos206

Measurement principle
Paramagnetic behavior of oxygen
Magnetomechanical oxygen analyzer

Sample component and measurement ranges
Sample component
Oxygen (O₂)

Smallest measurement range
0–2 vol.% O₂

Measurement range quantity
2 measurement ranges

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

Largest measurement range
0–100 vol.% O₂

Measurement ranges should not be set within ignition limits.

Measurement ranges with suppressed zero-point
Suppressed measurement ranges are freely adjustable in the range 0–100 vol.% O₂. Smallest span 2 vol.% O₂. The combination of a suppressed and an initial measurement range is not possible. Pressure correction with a pressure sensor is required. A pressure sensor is installed when the analyzer has been ordered with suppressed measurement range.

Stability
The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. Relative data refer to the span of the selected measurement range. The smallest span is 2 vol.% O₂.

Linearity deviation
≤ 0.5 % of span

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

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

Sensitivity drift
≤ 0.1 vol.% O₂ per week or ≤ 1 % of measured value per week (not cumulative), whichever is smaller.
≤ 0.25 % of measured value per year, minimum 0.05 vol.% O₂ per year

Output fluctuation (2 o)
≤ 25 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Detection limit (4 o)
≤ 50 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Influence effects

Flow effect
≤ 0.1 vol.% O₂ in the 30–90 l/h range

Associated gas effect
Data regarding the effect of associated gases can be found in IEC 61207-3:2002 “Gas analyzers – Expression of performance – Part 3: Paramagnetic oxygen analyzers”.

Temperature effect
Ambient temperature in the permissible range
– At zero-point: ≤ 1 % of span per 10 °C, ≤ 2 % of span per 10 °C
in combination with Uras26
– On sensitivity: ≤ 0.3 % of measured value per 10 °C
Thermostat temperature = 64 °C

Air pressure effect
– On sensitivity with no pressure correction:
  ≤ 1 % of measured value per 1 % air pressure change
– On sensitivity with pressure correction using integrated pressure sensor (optional):
  ≤ 0.1 % of measured value per 1 % air pressure change;
  for highly suppressed measurement ranges ≤ 0.01 % of measured value per 1 % air pressure change or ≤ 0.002 % measured value per 1 % air pressure change, whichever is greater.

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

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

Warm-up time
< 1 hour

90% response time
T<sub>90</sub> approx. 4 sec at a sample gas flow of 90 l/h and electronic T90 time (static/dynamic) = 3/0 sec, gas change from nitrogen to air

Calibration

Zero-point calibration
With oxygen-free process gas or substitute gas

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

Single-point calibration
Zero-point calibration with any oxygen concentration, e.g. with nitrogen or ambient air, processed through a cooler or H<sub>2</sub>O absorber.
Pressure correction by means of pressure sensor is recommended for single-point calibration with air.
Depending on the measurement task involved, the zero- and end-points should be verified periodically (recommendation: once a year).

Calibration of measurement ranges with suppressed zero-point
Highly suppressed measurement ranges (≥95–100 vol.% O<sub>2</sub>) should only be calibrated with test gases with concentrations in the selected measurement range.

Materials in contact with the sample medium

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

Gas connectors of the solenoid valve (option in model EL3020)
PVDF

Gas connections
See page 30

Sample gas inlet conditions

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

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

Pressure
Operation under atmospheric pressure: The sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request.
Operation under elevated pressure: A pressure sensor is required for pressure influence compensation.
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 analyzer is function-tested for 5000 hPa internal pressure without damage.

Flow rate
30–90 l/h

Corrosive gases
Consultation with ABB Analytical is required if the sample gas contains Cl<sub>2</sub>, HCl, HF or other corrosive components.
The AO2000-Magnos206 analyzer should be used if the sample gas contains NH<sub>3</sub>.

Flammable gases
The analyzer is suitable for measuring flammable gases in general purpose environment (see page 22).
Oxygen analyzer Magnos28

Measurement principle
Paramagnetic behavior of oxygen
Magnetomechanical oxygen analyzer

Sample component and measurement ranges

Sample component
Oxygen (O₂)

Smallest measurement range
0–2 vol.% O₂

Measurement range quantity
2 measurement ranges

Measurement range limits
Measurement ranges are freely adjustable; they are factory-set per order to 0–5 vol.% O₂ or 0–25 vol.% O₂ or 0–100 vol.% O₂ or 98–100 vol.% O₂.

Largest measurement range
0–100 vol.% O₂

Measurement ranges should not be set within ignition limits.

Measurement ranges with suppressed zero-point
Suppressed measurement ranges are freely adjustable in the range 0–100 vol.% O₂. Smallest span 2 vol.% O₂. The combination of a suppressed and an initial measurement range is not possible. Pressure correction with a pressure sensor is required. A pressure sensor is installed when the analyzer has been ordered with suppressed measurement range.

Stability
The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant.

Linearity deviation
≤ 0.5 % of span, at least 0.005 Vol.-% O₂

Repeatability
≤ 50 ppm O₂

Zero drift
≤ 3 % of span of the smallest measurement range (per order) per week, minimum 300 ppm O₂ per week

Sensitivity drift
≤ 0.1 vol.% O₂ per week or ≤ 1 % of measured value per week (not cumulative), whichever is smaller; ≤ 0.15 % of measured value per three months, minimum 0.03 vol.% O₂ per three months

Output fluctuation (2σ)
≤ 25 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Detection limit (4σ)
≤ 50 ppm O₂ at electronic T90 time (static/dynamic) = 3/0 sec

Influence effects

Flow effect
≤ 0.1 vol.% O₂ in the 30–90 l/h range

Associated gas effect
Data regarding the effect of associated gases can be found in IEC 61207-3:2002 “Gas analyzers – Expression of performance – Part 3: Paramagnetic oxygen analyzers”.

Temperature effect
Ambient temperature in the permissible range
– At zero-point: ≤ 0.02 vol.% O₂ per 10 °C
– On sensitivity: ≤ 0.3 % vol.% O₂ per 10 °C
Thermostat temperature = 60 °C

Air pressure effect
– On sensitivity with no pressure correction:
  ≤ 1 % of measured value per 1 % air pressure change
– On sensitivity with pressure correction using integrated pressure sensor (optional):
  ≤ 0.1 % of measured value per 1 % air pressure change;
  for highly suppressed measurement ranges ≤ 0.01 % of measured value per 1 % air pressure change or ≤ 0.002 vol.% O₂ per 1 % air pressure change, whichever is greater.

Power supply effect
DC 24 V ± 5 %: within detection limit

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

Warm-up time
< 1 hour

90% response time
T_{90} ≤ 3 sec at a sample gas flow of 90 l/h and electronic T90 time (static/dynamic) = 3/0 sec, gas change from nitrogen to air (see "Gas connections", applies to an analyzer unit only with Magnos28)

Calibration

Zero-point calibration
With oxygen-free process gas or substitute gas

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

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

Calibration of measurement ranges with suppressed zero-point
Highly suppressed measurement ranges (≥95–100 vol.% O2) should only be calibrated with test gases with concentrations in the selected measurement range.
Single-point calibration can also be done within a suppressed measurement range. The O2 concentration of the test gas must lie within the measurement range.

Materials in contact with the sample medium

Analyzer
Stainless steel 1.4305 (SAE 303), nickel alloy, glass, PtNi, silicon, gold, PTFE, FPM seals, optional: FFKM75

Gas connectors of the solenoid valve (option in model EL3020)
PVDF

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

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

Pressure
The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request.
Operation under elevated pressure: A pressure sensor is required for pressure influence compensation. 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. Correction is done externally.

Flow rate
30–90 l/h
Changes of the sample gas flow rate should be avoided in highly suppressed measurement ranges.

Corrosive gases
Consultation with ABB Analytical is required if the sample gas contains Cl2, HCl, HF or other corrosive components. FFKM75 seals must be used if the sample gas contains NH3. 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 suitable for measuring flammable gases in general purpose environment (see page 22).

Gas connections
See page 31
Oxygen analyzer Magnos27

Measurement principle
Paramagnetic behavior of oxygen
Heavy-duty thermomagnetic analyzer

Sample component and measurement ranges
Sample component
Oxygen (O₂) in flue gas or in nitrogen (N₂)
Smallest measurement range
0–10 vol.% O₂
Measurement range quantity
2 measurement ranges
Measurement range limits
The measurement range is factory-set per customer order.
Largest measurement range
0–100 vol.% O₂
Measurement ranges within ignition limits cannot be provided.

Stability
Linearity deviation
≤ 2 % of span
Repeatability
≤ 1 % of span
Zero drift
≤ 1 % of span per week
Sensitivity drift
≤ 2 % of measured value per week
Output fluctuation (2σ)
≤ 0.5 % of smallest measurement range span at electronic T90 time = 0 sec
Detection limit (4σ)
≤ 1 % of smallest measurement range span at electronic T90 time = 0 sec

Influence effects
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 sensitivity: ≤ 0.5 % of measured value per 10 °C relative to temperature at the time of calibration
Thermostat temperature = 63 °C
Air pressure effect
– At zero-point: < 0.05 vol.% O₂ per 1 % air pressure change
– On sensitivity without pressure correction:
  ≤ 1.5 % of measured value per 1 % air pressure change
– On sensitivity with pressure correction using integrated pressure sensor (optional):
  ≤ 0.25 % of measured value per 1 % air pressure change
Option: Operating altitude over 2000 m
Power supply effect
DC 24 V ± 5 %: ≤ 0.2 % of span
Position effect
Approx. 3 % of smallest measurement range span per 1° deviation from horizontal orientation. Position has no effect on the hard-mounted unit.
**Dynamic response**

**Warm-up time**
2–4 hours

**90% response time**
$T_{90} = 10–22$ sec, depending on sample gas flow and on measurement cell connection (see “Gas connections”, applies to an analyzer unit 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 in contact with the sample medium**

**Analyzer**
Rust- and acid-resistant steel 1.4580 (SAE 316Cb) and 1.4305 (SAE 303), glass

**Gas lines and connectors**
Rust- and acid-resistant steel 1.4571 (SAE 316Ti) and 1.4305 (SAE 303), PVC-C, FPM

**Sample gas inlet conditions**

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

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

**Pressure**
The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request. Overpressure in the sample cell max. 100 hPa.

**Flow rate**
20–90 l/h

**Note**
The analyzer can only be mounted in the 19-inch housing (dimensional drawing see page 32). The analyzer cannot be used in combination with the integral gas feed.

**Gas connections**
See page 32
Trace oxygen analyzer ZO23

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

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

Sample component and measurement ranges

Sample component
Oxygen (O₂)

Measurement range quantity
2 measurement ranges

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

The following measurement data refer to a measurement span of 100 ppm O₂ with a regulated flow rate of 8 ± 0.2 l/h.

Stability

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

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

Zero drift
The zero point (reference point) is displayed if ambient air is present on the sample gas side. The value for air of 20.6 % vol. of O₂ (for 25 °C and 50 % relative humidity) may deviate through aging of the cell.
< 1 % of the measurement range per week or 250 ppb O₂ (whichever is greater)

Sensitivity drift
Depends on possible interfering components (catalyst poisons) in the sample gas and the aging of the cell.
For pure gas measurements in N₂ and Ar:
< 1 % of the measurement range per week or 250 ppb O₂ (whichever is greater)

Output fluctuation (2σ)
< ±0.5 % of the measured value or 50 ppb O₂ (whichever is greater)

Influence effects

Flow effect
≤ 300 ppbv O₂ in the permissible range

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

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

Air pressure effect
No effect through a change in air pressure; the 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. 2–5 hours.

90% response time
$T_{90} < 60$ sec for the alternation of 2 test gases in the measurement range 10 ppm with a sample gas flow rate $= 8$ l/h and electronic $T_{90}$ 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 in Ar); O$_2$ concentration in the measurement range, e.g. 10 ppm O$_2$

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

Materials in contact with the sample medium

Analyzer
Zirconium dioxide cell: ZrO$_2$, electrodes containing platinum; dust filter (option): PP; flow sensor (option): on semiconductor basis, nickel-plated brass

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

Gas connections
See page 33

Sample gas inlet conditions

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

Temperature
+5 to +50 °C

Inlet pressure
$p_e \leq 70$ hPa

Outlet pressure
Atmospheric pressure

Flow rate
4–20 l/h. Use a metering valve to set the flow rate.

Corrosive gases
The presence of corrosive gases and catalyst poisons, e.g. halogens, gases containing sulfur and heavy-metal dust, leads to faster aging and/or destruction of the ZrO$_2$ cell.

Flammable gases
The analyzer is suitable for measuring flammable gases in general purpose environment (see page 22). The concentration of flammable gases in the sample gas must not exceed 100 ppm.

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

Note
The analyzer cannot be used in combination with the integral gas feed.
Thermal conductivity analyzer Caldos27

**Measurement principle**
Difference in thermal conductivity of various gases
Micromechanical silicon sensor with especially short T90 time

**Sample components and measurement ranges**

<table>
<thead>
<tr>
<th>Sample component and associated gas</th>
<th>Smallest meas. range</th>
<th>Smallest meas. range with suppr. zero-point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in Ar</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>Ar in air</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>Air in CO₂</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>CO₂ in air</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>Air in H₂</td>
<td>0–3 vol.%</td>
<td>–</td>
</tr>
<tr>
<td>H₂ in air</td>
<td>0–1 vol.%</td>
<td>–</td>
</tr>
<tr>
<td>Air in He</td>
<td>0–3 vol.%</td>
<td>98–100 vol.%</td>
</tr>
<tr>
<td>He in air</td>
<td>0–2 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>Ar in CO₂</td>
<td>–</td>
<td>50–100 vol.%</td>
</tr>
<tr>
<td>CO₂ in Ar</td>
<td>0–50 vol.%</td>
<td>–</td>
</tr>
<tr>
<td>Ar in H₂</td>
<td>0–3 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>H₂ in Ar</td>
<td>0–1 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>Ar in He</td>
<td>0–3 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>He in Ar</td>
<td>0–1 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>Ar in N₂</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>N₂ in Ar</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>Ar in O₂</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>O₂ in Ar</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>CH₄ in H₂</td>
<td>0–4 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>H₂ in CH₄</td>
<td>0–1 vol.%</td>
<td>96–100 vol.%</td>
</tr>
<tr>
<td>CH₄ in N₂</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>N₂ in CH₄</td>
<td>0–6 vol.%</td>
<td>94–100 vol.%</td>
</tr>
<tr>
<td>CO in H₂</td>
<td>0–3 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>H₂ in CO</td>
<td>0–1 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>CO₂ in H₂</td>
<td>0–3 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>H₂ in CO₂</td>
<td>0–1 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>CO₂ in N₂</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>N₂ in CO₂</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>H₂ in N₂</td>
<td>0–1 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>N₂ in H₂</td>
<td>0–3 vol.%</td>
<td>99–100 vol.%</td>
</tr>
<tr>
<td>H₂ in NH₃</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>NH₃ in H₂</td>
<td>0–10 vol.%</td>
<td>90–100 vol.%</td>
</tr>
<tr>
<td>He in N₂</td>
<td>0–2 vol.%</td>
<td>97–100 vol.%</td>
</tr>
<tr>
<td>N₂ in He</td>
<td>0–3 vol.%</td>
<td>98–100 vol.%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sample component and associated gas</th>
<th>Measurement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ in air or Ar in air</td>
<td>0–100 vol.%</td>
</tr>
<tr>
<td>H₂ in CO₂ or H₂ in Ar</td>
<td>100–0 vol.%</td>
</tr>
<tr>
<td>H₂ in air</td>
<td>100–80 vol.%</td>
</tr>
</tbody>
</table>

Other sample components on request.

**Measurement range quantity**
2 measurement ranges.

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

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

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

- **Linearity deviation**
  ≤ 2 % of span

- **Repeatability**
  ≤ 1 % of span

- **Zero drift**
  ≤ 2 % of smallest possible measurement range per week

- **Sensitivity drift**
  ≤ 0.5 % of smallest possible measurement range per week

- **Output fluctuation (2σ)**
  ≤ 0.5 % of smallest measurement range span at electronic T90 time = 0 sec

- **Detection limit (4σ)**
  ≤ 1 % of smallest measurement range span at electronic T90 time = 0 sec

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

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

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

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

- **Air pressure effect**
  ≤ 0.25 % of span per 10 hPa for the smallest possible ranges given; for larger spans the effect is correspondingly lower.

- **Power supply effect**
  Voltage and frequency in the permissible range: ≤ 0.2 % of span

- **Position effect**
  < 1 % of span up to 30° deviation from horizontal orientation
**Dynamic response**

**Warm-up time**
Approx. 30 minutes

**90% response time**
$T_{90} \leq 2$ sec at sample gas flow of 60 l/h and electronic $T_{90}$ time (static/dynamic) = 0/0 sec

**Calibration**

**Zero-point calibration**
With test gas, measurement component-free process gas or substitute gas

**End-point calibration**
With test gas, process gas having a known sample gas concentration or substitute gas

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

**Materials in contact with the sample medium**

**Analyzer**
Sample chamber (direct connection): stainless steel 1.4305 (SAE 303); sensor: gold, silicon oxi-nitride; seal: FFKM75 (Perfluoro rubber)

**Gas connectors of the solenoid valve (option in model EL3020)**
PVDF

**Gas connections**
See page 34

**Sample gas inlet conditions**

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

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

**Pressure**
The analyzer is operated under atmospheric pressure; the sample gas outlet is open to atmosphere. Internal pressure drop < 5 hPa with standard flow rate 60 l/h. Permissible absolute pressure range: 800–1250 hPa. Operation under lower absolute pressure (e.g. at altitudes above 2000 m) on request. Overpressure in the sample cell max. 100 hPa.

**Flow rate**
Normally 10–90 l/h, minimum 1 l/h

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

**Flammable gases**
The analyzer is suitable for measuring flammable gases in general purpose environment (see page 22).
Flame-ionization detector Fidas24

Measurement principle
Flame-ionization detector
The analyzer complies with the requirements for measuring instruments with flame ionization detection according to EN 12619.

Sample components and measurement ranges

Sample components
Hydrocarbons (THC). The sample component concentration in the sample gas should not exceed 100 % of the LEL.

Number of sample components
1 sample component

Smallest measurement range
0–5 to 0–1500 mg org. C/m³ or 0–10 to 0–3000 ppm C₁

Largest measurement range
0–18 to 0–5000 mg org. C/m³ or 0–35 to 0–10000 ppm C₁

Measurement range quantity
2 measurement ranges

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

Stability
The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They apply to measurement ranges ≥ 50 mg org. C/m³, for smaller ranges these only apply if they are factory-set per customer order.

Linearity deviation
≤ 2 % of the span to 5000 mg org. C/m³
this value applies in one (calibrated) measurement range

Repeatability
≤ 0.5 % of measurement range

Zero-point and sensitivity drift
≤ 0.5 mg org. C/m³ per week

Output fluctuation (2σ)
≤ 0.5 % of span at electronic T90 time = 20 sec, not smaller than 10 µg org. C/m³

Detection limit (4σ)
≤ 1 % of span at electronic T90 time = 20 sec, not smaller than 20 µg org. C/m³

Influence effects

Oxygen dependence
≤ 2 % of measured value for 0–21 vol.% O₂ or ≤ 0.3 mg org. C/m³, the larger value applies

Temperature effect
Ambient temperature in permissible range at zero-point and on sensitivity: ≤ 2 % per 10 °C in measurement range of 0–15 mg org. C/m³

Pressure effect
No effect of ambient pressure or process pressure fluctuations within the permissible sample gas inlet pressure range

Power supply effect
DC 24 V ± 5 %: ≤ 0.2 % of span or AC 230 V ± 10 %: ≤ 0.2 % of span
**Dynamic response**

**Warm-up time**
≤ 2 hours

**90% response time**
\[ T_{90} < 1.5 \text{ sec} \] at sample gas flow = 80 l/h and electronic T90 time = 1 sec

**Calibration**

**Zero-point calibration**
With synthetic air or catalytically purified air or nitrogen, depending on application

**Sensitivity calibration**
With propane or another hydrocarbon (substitute gas) in air or nitrogen, depending on application

**Materials in contact with the sample medium**

**Analyzer, gas lines and connectors**
Stainless steel 1.4305 (SAE 303) and 1.4571 (SAE 316Ti), FPM, PTFE, FFKM

**Gas connections**
See page 35

**Operating gases and test gases**

**Instrument air**
Quality per ISO 8573-1 class 2 (max. particle size 1 µm, max. particle concentration 1 mg/m³, max. oil content 0.1 mg/m³, pressure dew point at least 10 °C below the lowest foreseeable ambient temperature)
Inlet pressure \( p_i = 4000 \pm 500 \) hPa
Flow rate typically approx. 1800 l/h (1200 l/h for air injector and approx. 600 l/h for housing purge), maximum approx. 2200 l/h (1500 l/h + 700 l/h)

**Combustion air**
Synthetic air or catalytically purified air with an organic C content < 1 % span
Inlet pressure \( p_i = 1200 \pm 100 \) hPa
Flow rate ≤ 20 l/h

**Combustion gas**
Hydrogen (H₂), grade 5.0, or H₂/He mixture (40/60 %)
Inlet pressure \( p_i = 1200 \pm 100 \) hPa
Flow rate ≤ 3 l/h (H₂) or approx. 10 l/h (H₂/He)
A flow limiting device must be provided on the hydrogen supply (see section “Safe operation of the gas analyzer”).

**Test gases**
Zero-point calibration: Nitrogen, grade 5.0, or synthetic air or catalytically purified air
Sensitivity calibration: Sample component or substitute gas component in nitrogen or air
Inlet pressure \( p_i = 1000 \pm 100 \) hPa
Flow rate 130–250 l/h

**Sample gas inlet conditions**

The sample gas may not be explosive at any time.
The analyzer must not be used for measurement of gases containing organometallic compounds, e.g. leaded gasoline additives or silicone oils.

**Temperature**
≤ thermostat temperature (Thermostat temperature for measurement gas path, detector and air injector ≤ 200 °C, factory-set to 180 °C)

**Inlet pressure**
\( p_{\text{in}} = 800–1100 \) hPa

**Outlet pressure**
Atmospheric pressure

**Flow rate**
Approx. 80–100 l/h at atmospheric pressure (1000 hPa)

**Humidity**
≤ 40 % H₂O

**Flammable gases**
The analyzer can be used for measurement of flammable gases as long as the total flammable portion does not exceed 15 vol.% CH₄ or C1 equivalents.

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

**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 of H₂ or 25 l/h of H₂/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 the safety in the following operating states: 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 in the vicinity of the combustion gas supply.
Electrochemical oxygen sensor

Measurement principle
Electrochemical oxygen sensor

Sample component and measurement range
Sample component
Oxygen (O₂)

Smallest measurement range
0–5 vol.% O₂

Measurement range
Factory-set to 0–25 vol.% O₂. Adjustable from 0–5 vol.% O₂ to 0–25 vol.% O₂

Stability
Linearity deviation
Linear in the range > 1 vol.% O₂

Repeatability
≤ 0.5 % of span

Zero drift
Stable over long-term due to absolute zero point

Sensitivity drift
≤ 1 % of the measurement range per week

Output fluctuation (2σ)
≤ 0.2 % of the measurement range at electronic T90 time
(static/dynamic) = 5/0 sec

Detection limit (4σ)
≤ 0.4 % of the measurement range at electronic T90 time
(static/dynamic) = 5/0 sec

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

Temperature effect
Ambient temperature in the +5 to +40 °C range:
≤ 0.2 vol.% O₂ per 10 °C

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

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

Dynamic response
90% response time
T₉₀ ≤ 30 sec at sample gas flow of 60 l/h and electronic T90 time
(static/dynamic) = 5/0 sec

Calibration
Zero-point calibration
The oxygen sensor zero is not calibrated since it is fundamentally stable.

End-point calibration
With ambient air at 20.96 vol.% O₂

Materials in contact with the sample medium
Sensor: Polystyrol-ABS, PTFE, FPM (Fluorocarbon rubber);
Housing body: PVC, FPM (Fluorocarbon rubber) seals;
Gas ports: Stainless steel 1.4571 (SAE 316Ti)

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

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

Pressure
The sample gas pressure is determined by the analyzer the oxygen sensor is combined with (see Note below).

Flow rate
20–100 l/h

Moisture content
H₂O dew point ≥ 2 °C
The oxygen sensor should not be used with dry sample gas.

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

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 the Uras26 are made up of stainless steel or PTFE pipes.
Integral gas feed

Versions
The integral gas feed (optional in model EL3020) is available in two versions. It includes
– either the solenoid valve, pump, coarse filter, capillary tube and flow sensor modules
– or the flow sensor module.

Test gas supply
Type
3/2-way solenoid valve

Power consumption
Approx. 3 W

Materials in contact with the sample medium
PVDF, FPM

Gas feed
Type
Magnetic piston pump

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

Flow rate
Adjustable

Power consumption
Approx. 10 W

Materials in contact with the sample medium
PVDF, EPDM, stainless steel 1.4571 (SAE 316Ti)

Flow monitor
Type
Miniature flow sensor

Materials in contact with the sample medium
Al₂O₃, silicon, gold, GRP

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

Temperature
+5 to +45 °C

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

Flow rate
30–60 l/h

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

Note
The integral gas feed cannot be used when the internal gas lines are made up of stainless steel or PTFE pipes. It cannot be used in combination with Limas23, Magnos27, ZO23 or Fidas24.
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, Magnos206, Magnos28 (model EL3020 only), Caldos27 and ZO23 (concentration max. 100 ppm) is suitable for measuring flammable gases in general purpose environment.
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 special requirements must be observed (see operating instruction).

Version with protection type II 3G for installation in hazardous location for measurement of non-flammable gases and vapors
The gas analyzer (model EL3040) with Uras26, Magnos206, Caldos27 and oxygen sensor is tested for explosion protection. It is suitable for installation in hazardous locations when the technical data are observed.
The gas analyzer may be used for measurement of non-flammable gases and vapors. It is marked according to the European directive 2014/34/EU with

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 devices with low power consumption; sealed or encapsulated devices.

Type Examination Certificate No. BVS 16 ATEX E 085 X
Housing degree of protection IP65
The special requirements must be observed (see operating instruction).

General data

Display and operation

Display
Backlit graphics display with 240 x 160-pixel resolution

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

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

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

Measuring range switch-over and feedback
There are three ways of executing the measuring range switch-over:
- Manually on the gas analyzer
- Automatically by means of appropriate configured switch-over thresholds ("autorange")
- Externally controlled via appropriately configured digital inputs.
The measuring range feedback can be implemented via appropriately configured digital outputs; it is independent of the selected type of measuring range switch-over.
The gas analyzer is set ex works to measuring range 2 and to manual measuring range switch-over.

Limit value monitoring
Limit values can be set using the configuration software ECT ("EasyLine Configuration Tool" on the enclosed DVD-ROM). The limit value signals (alarms) are output via digital outputs.

Housing

<table>
<thead>
<tr>
<th>Model EL3020</th>
<th>Model EL3040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>19-inch housing</td>
</tr>
<tr>
<td>Protection type</td>
<td>IP20 (IP40 1))</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Galvanized sheet steel</td>
</tr>
<tr>
<td>Outer surfaces</td>
<td>varnished</td>
</tr>
<tr>
<td>Analyzer rear panel</td>
<td>Aluminum, PVC-C</td>
</tr>
<tr>
<td>Keypad sheet</td>
<td>Polyester</td>
</tr>
<tr>
<td>Colors</td>
<td>Light gray (RAL 7035), basalt gray (RAL 7012)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 7–15 kg</td>
</tr>
<tr>
<td>Dimensions</td>
<td>See page 36</td>
</tr>
</tbody>
</table>

1) with version for emission monitoring

Housing purge
Possible only with model EL3040 (wall-mount housing).
Housing purge is mandatory when measuring flammable gases (see page 22). Purge gas flow during operation min. 10 l/h, max. 20 l/h. Purge gas pressure $p_e = 2–4$ hPa.
Pressure sensor

Use
Standard: with Uras26, Limas23, Caldos27,
Option: with Magnos206, Magnos28 and Magnos27

Working range
pabs = 600–1250 hPa

Materials in contact with the sample medium
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 filtration

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

Retention rate
99.99 % for particles > 0.1 µm

Materials in contact with the sample medium
Polyamide, borosilicate glass with PVDF binder

Safety
Tested per EN 61010-1:2010

Protection class I

Overvoltage category/pollution degree
II/2

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

Electromagnetic compatibility

Noise immunity
Tested to EN 61326-1:2013. Inspection severity: Industrial area,
fulfills at least the test requirements to table 2 of EN 61326.

Emitted interference
Tested to EN 61326-1:2013. Limit value class B for interference
field strength and interference voltage is met.

Mechanical stress

Operation
Vibration test to EN 60068-2-6:1996
In Uras26, slight transient effects on the measured value can oc-
cur in the region of the modulation frequency.

Transport
Vibration test to EN 60068-2-6:1996,
shock test to EN 60068-2-27:1995
In its original packaging, the gas analyzer will withstand normal
shipping conditions.

Installation site requirements

Installation location
The gas analyzer is intended for indoor installation only. Installa-
tion location altitude max. 2000 m above sea level (over 2000 m
on request)

Ambient temperature
Operation: +5 to +45 °C, Uras26 in combination with another ana-
lyzer, Limas23, Fidas24: +5 to +40 °C, Storage and transport:
−25 to +65 °C

Relative humidity
< 75 %, slight condensation allowed

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

Power supply

Input voltage
AC 100 to 240 V - 15/+ 10 %, 50 to 60 Hz ± 3 Hz

Power consumption
Max. 187 VA

Connection
3-pin plug per EN 60320-1/C14; connection cable supplied.
Connection diagrams see page 24.

Individual analyzers

Input voltage
DC 24 V ± 5 %

Power consumption
Uras26: max. 95 W Magnos27: max. 35 W
Limas23: max. 100 W ZO23: max. 35 W
Magnos206: max. 50 W Caldos27: max. 17 W
Magnos28: max. 50 W Fidas24: max. 40 W

Fidas24: Heating of detector and sample gas inlet

Input voltage
AC 115 V or 230 V, ± 15 % (max. 250 V), 47 to 63 Hz

Power consumption
125 VA for detector heating,
125 VA for heated sample gas inlet (option)

Connection
4-pin plug; connection cable supplied.
Connection diagrams see page 35.

Note regarding the analyzers performance charac-
teristics

The performance characteristics of the analyzers have been de-
termined according to IEC 61207-1:2010 “Expression of perfor-
mance of gas analyzers – Part 1: General”. They are based on op-
eration 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 com-
position is known. The physical detection limit is the lower limit
of the performance characteristics relative to the measuring
range span.
Electrical connections

Power supply and signal lines model EL3020 (view from behind)

Power supply and signal lines model EL3040 (view from below)

1. Power supply connection
   (3-pin plug per EN 60320-1/C14; connection cable supplied)
   I/O modules (4 slots), options:

2. Digital I/O module (max. 3 modules, see page 26)
3. Analog output module (max. 2 modules, see page 25)
4. Modbus module (RS232 & RS485 interface, see page 25)
5. Profinet module (RS485 & MBP interface, see page 25)
6. Ethernet-10/100BASE-T interface (8-pin RJ45 plug)
7. Potential compensation connection (max. 4 mm²)

Screwed cable glands for cable diameter:

- **M20**: Power supply 5–13 mm
- **M25**: Modbus/Profinet 8–17 mm
- **M25**: Network 8–17 mm
- **M25**: Analog outputs 8–17 mm
- **M32**: Digital inputs/outputs 12–21 mm
- **M32**: Digital inputs/outputs 12–21 mm

**Note**

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

**Notes for I/O module connection**

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

Profibus module

Electrical connections
RS485 interface:
1 – Not used
2 M24 24 V output ground, max. 0.2 A
3 RXD/TXD-P Receive/transmit data plus, B-line
4 – Not used
5 DGND Data transmission potential (ref. potential for VP)
6 VP Supply voltage plus (5 V)
7 P24 24 V output voltage plus
8 RXD/TXD-N Receive/transmit data N, A-line
9 – Not used
Design: 9-pin sub-D female connector

MBP interface (non-intrinsically safe):
1 +
2 Shield
3 –
4 Not used
Design: 4-pin terminal strip. Observe the notes regarding I/O module connection (see page 24)!

Modbus module

Electrical connections
RS232 interface:
2 RXD
3 TXD
5 GND
Design: 9-pin sub-D male connector

RS485 interface:
2 RTXD–
3 RTXD+
5 GND
Design: 9-pin sub-D female connector

Analog output modules

Analog outputs (AO1 to AO4)
0/4–20 mA (configurable, factory-set to 4–20 mA), common negative pole, galvanically isolated from ground, freely connectable to ground, max. gain relative to protective ground potential 50 V, max. working resistance 750 Ω. Resolution 16 bit. The output signal cannot be lower than 0 mA.

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

Electrical connections
1 AO1+
2 AO1– for 2-way analog output module and
3 AO2+ 4-way analog output module
4 AO2–
5 AO3+
6 AO3– only for
7 AO4+ 4-way analog output module
8 AO4–
Design: 4-pin or 8-pin terminal strip. Observe the notes regarding I/O module connection (see page 24)!
… I/O modules

Digital I/O module

Digital inputs (DI1 to DI4)
Optocouplers with internal DC 24 V power supply, jointly galvanically isolated from ground. Control with floating contacts, with external voltage DC 12–24 V or with open collector drivers PNP or NPN.

Digital outputs (DO1 to DO4)
Floating double-throw contacts, max. contact load rating DC 30 V/1 A, galvanically isolated from ground. Relays must at all times be operated within the specified data range. Inductive or capacitive loads are to be connected with suitable protective measures (self-induction recuperation diodes for inductive loads and series resistors for capacitive loads).

Terminal assignment

| Digital Input and output signals | Standard assignment 1)
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>DI4</td>
</tr>
<tr>
<td>Maintenance request</td>
<td>DI3</td>
</tr>
<tr>
<td>Maintenance mode</td>
<td>DI2</td>
</tr>
<tr>
<td>Overall status</td>
<td>DI1</td>
</tr>
<tr>
<td>Start automatic calibration</td>
<td>DO4</td>
</tr>
<tr>
<td>Stop automatic calibration</td>
<td></td>
</tr>
<tr>
<td>Disable automatic calibration</td>
<td></td>
</tr>
<tr>
<td>Sample gas valve</td>
<td></td>
</tr>
<tr>
<td>Zero gas valve</td>
<td></td>
</tr>
<tr>
<td>Span gas valves 1–5</td>
<td></td>
</tr>
<tr>
<td>Pump on/off 2)</td>
<td></td>
</tr>
<tr>
<td>Limit 1</td>
<td></td>
</tr>
<tr>
<td>Limit 2</td>
<td></td>
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<tr>
<td>Limit 3</td>
<td></td>
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<tr>
<td>Limit 4</td>
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<td>Limit 5</td>
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<td>Limit 6</td>
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<td>Limit 7</td>
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<tr>
<td>Limit 8</td>
<td></td>
</tr>
<tr>
<td>Limit 9</td>
<td></td>
</tr>
<tr>
<td>Limit 10</td>
<td></td>
</tr>
<tr>
<td>Measuring range switch-over</td>
<td></td>
</tr>
<tr>
<td>Measuring range feedback</td>
<td></td>
</tr>
<tr>
<td>Measuring component switch-over</td>
<td></td>
</tr>
<tr>
<td>Measuring component feedback</td>
<td></td>
</tr>
<tr>
<td>Bus DI 1–8</td>
<td></td>
</tr>
<tr>
<td>External failure 3)</td>
<td></td>
</tr>
<tr>
<td>External maintenance request 1)</td>
<td></td>
</tr>
</tbody>
</table>

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

Electrical connections
See connection diagram
Design: 2x12-pin terminal strip. Observe the notes regarding I/O module connection (see page 24)!
Relays are shown in the unpowered state. The unpowered state is the failure mode.
Gas connections Uras26

Model EL3020 (Internal gas lines: FPM hoses)

1. Sample gas inlet gas path 1 without "Integral gas feed" option
2. Sample gas outlet gas path 1 connected to sample gas inlet of Magnos206, Magnos28 or Caldos27 if applicable
3. Sample gas outlet for "Integral gas feed" option, factory-connected to sample gas inlet gas path 1
4. Sample gas inlet for "Integral gas feed" option with flow sensor only (without solenoid valve) or pressure sensor (option)
5. Sample gas outlet gas path 2 or flowing reference gas outlet (option)
6. Sample gas inlet gas path 2 or flowing reference gas inlet (option)

Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

Notes: Pressure sensor (standard) and oxygen sensor (option) are connected internally as follows:
- Downstream the sample cell 1 outlet for one sample cell or for two separate gas paths,
- Downstream the sample cell 2 outlet for two sample cells in series.
- The second oxygen sensor (option for version with two separate gas paths) is connected downstream the sample cell 2 outlet.
- The pressure sensor can be directly connected to inlet 4 as an option.

Model EL3020 (Internal gas lines: PTFE or stainless steel pipes)

6. Pressure sensor

Design: Screwed fitting with hose nozzles (stainless steel 1.4305/SAE 303) for hose with 4 mm inner diameter (supplied)

11. Sample gas inlet
12. Sample gas outlet for one sample cell connected to sample gas inlet of Magnos206, Magnos28 or Caldos27 if applicable
13. Sample gas outlet for two sample cells in series Magnos206, Magnos28 or Caldos27 if applicable

Design: ¼ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied)

Notes: Oxygen sensor, "Integral gas feed", "Flowing reference gas" options and version with two separate gas paths cannot be provided.
... Gas connections Uras26

Model EL3040 (Internal gas lines: FPM hoses or PTFE or stainless steel pipes)

One gas path with one sample cell or two sample cells in series

1. Pressure sensor (option)
2. Not used
3. Sample gas inlet
4. Sample gas outlet for one sample cell
5. Purge gas inlet housing
6. Purge gas outlet housing
7. Not used
8. Sample gas outlet for two sample cells in series
9. Flowing reference gas inlet (sample cell 1, option)
10. Flowing reference gas outlet (sample cell 1, option)

Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied for purge gas connections and for sample gas connections when internal gas paths are made up of FPM hoses.)

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

When the internal gas paths are made up of PTFE or stainless steel pipes, the options oxygen sensor and “Flowing reference gas” cannot be provided.

The pressure sensor can be directly connected to inlet 1 as an option.
Gas connections Limas23

Model EL3020

1 Sample gas inlet
2 Sample gas outlet (connected to sample gas inlet of Magnos206 or Magnos28 if applicable)

Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

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

Model EL3040

11 Purge gas inlet housing
12 Purge gas outlet housing
13 Sample gas inlet
14 Sample gas outlet (connected to sample gas inlet of Magnos206 or Magnos28 if applicable)

Design: ¼ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)

Note: Pressure sensor (standard) and oxygen sensor (option) are connected internally downstream the sample cell.
**Gas connections Magnos206**

**Model EL3020**

1. Sample gas inlet
2. Sample gas outlet

Design: \( \frac{1}{8} \) NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)

3. Sample gas outlet for “Integral gas feed” option, factory-connected to 1 sample gas inlet
4. Sample gas inlet for “Integral gas feed” option with flow sensor only (without solenoid valve)
6. Pressure sensor (option)

Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

21. Sample gas inlet at solenoid valve for “Integral gas feed” option with
22. Test gas inlet at solenoid valve solenoid valve, pump, filter, capillary and flow sensor

Design: Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inner diameter (supplied)

**Model EL3040**

1. Sample gas inlet
2. Sample gas outlet
3. not used
4. not used
11. Purge gas inlet housing
13. Pressure sensor (option)

Design: \( \frac{1}{8} \) NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)
Gas connections Magnos28

Model EL3020

1. Sample gas inlet
2. Sample gas outlet
Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)

3. Sample gas outlet for “Integral gas feed” option, factory-connected to 1 sample gas inlet
4. Sample gas inlet for “Integral gas feed” option with flow sensor only (without solenoid valve)
6. Pressure sensor (option)
Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

21. Sample gas inlet at solenoid valve for “Integral gas feed” option with
22. Test gas inlet at solenoid valve, pump, filter, capillary and flow sensor
Design: Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inner diameter (supplied)

Model EL3040

1. Sample gas inlet
11. Purge gas inlet housing
13. Pressure sensor (option)
2. Sample gas outlet
12. Purge gas outlet housing
14. not used
Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)
Gas connections and dimensions Magnos27

Gas connections

**Magnos27**
- 1 Pressure sensor (option)
- 2 not used
- 3 Sample gas inlet
- 4 Sample gas outlet
- 5 Purge gas inlet analyzer
- 6 Purge gas outlet analyzer

**Magnos27 in combination with Uras26 (one gas path, internal gas lines: FPM hoses)**
- 1 Sample gas inlet Uras26
- 2 Sample gas outlet Uras26
- 3 Sample gas inlet Magnos27
- 4 Sample gas outlet Magnos27
- 5 Purge gas inlet Magnos27
- 6 Purge gas outlet Magnos27

Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

Notes: (for Magnos27 in combination with Uras26)
- The pressure sensor (standard) is connected internally downstream the Uras26 sample cell.
- The pressure sensor can be directly connected to inlet 6 as an option (Magnos27 without sample chamber purging).

Dimensions

Note: Only the front view of the housing (with its height differing from the standard dimension) is depicted in this dimensional drawing. Refer to the dimensional drawing on page 36 for other views and dimensions of the 19-inch housing.
Gas connections ZO23

Model EL3020

Model EL3040

1 Sample gas inlet
2 Sample gas outlet
11 Purge gas inlet housing
12 Purge gas outlet housing

Design: ¼ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied),
        sample gas inlet 3 mm Swagelok® (stainless steel 1.4401/SAE 316)
Gas connections Caldos27

Model EL3020

1 Sample gas inlet
2 Sample gas outlet

Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)

3 Sample gas outlet for "Integral gas feed" option, factory-connected to 1 sample gas inlet
4 Sample gas inlet for "Integral gas feed" option with flow sensor only (without solenoid valve)
6 Pressure sensor

Design: Screwed fittings with hose nozzles (stainless steel 1.4305/SAE 303) for hoses with 4 mm inner diameter (supplied)

21 Sample gas inlet at solenoid valve for "Integral gas feed" option with
22 Test gas inlet at solenoid valve solenoid valve, pump, filter, capillary and flow sensor

Design: Screwed fittings with hose nozzles (PVDF) for hoses with 4 mm inner diameter (supplied)

Model EL3040

1 Sample gas inlet
3 not used
11 Purge gas inlet housing
13 Pressure sensor

2 Sample gas outlet
4 not used
12 Purge gas outlet housing
14 not used

Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied; screwed fittings with hose nozzles (PP) for hoses with 4 mm inner diameter supplied)
Gas connections and electrical connections Fidas24

Model EL3020

Model EL3040

30  Power supply AC 115 V or 230 V for heating of detector and sample gas inlet (4-pin male plug, connecting cable supplied)
31  Electrical connection to heated sample gas inlet (fixed)
32  Test gas outlet
33  Zero-point gas inlet
34  End-point gas inlet
35  Combustion air inlet
36  Combustion gas inlet
37  Instrument air inlet
Design: ⅛ NPT female thread (stainless steel 1.4305/SAE 303) for threaded connections (not supplied)
38  Exhaust outlet
Design: Threaded connection for 6-mm outer diameter tubing, permissible maximum length of 30 cm; after that point the inner diameter of the exhaust line should be increased to ≥ 10 mm.
39  Sample gas inlet, heated or unheated
Design: Threaded connection for PTFE or stainless steel tubing with a 6-mm outer diameter
40  Pressure compensation opening with protection filter (only in wall-mount housing)
Dimension

19-inch housing (model EL3020)
Wall-mount housing (model EL3040)

Clearance required to allow the door to swing open

Dimensions in mm (inch)
Certifications

Performance tests

The EL3000 series gas analyzers Uras26 (sample components CO, NO, SO₂, CO₂, N₂O) and electrochemical oxygen sensor (sample component O₂) are certified for use in combustion plants according to Directive 2010/75/EU Chapter III (formerly Directive 2001/80/EG, 13th BImSchV), waste incineration plants according to Directive 2010/75/EU Chapter IV (formerly Directive 2000/76/EG, 17th BImSchV) and other plants requiring official approval. The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.


The EL3000 Series gas analyzers Uras26 (sample components CO, NO, NOₓ, SO₂, N₂O, CO₂), Magnos206 (sample component O₂), Magnos28 (sample component O₂) and electrochemical oxygen sensor (sample component O₂) 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 according to EN 14181:2014. Certificate No. Sira MC080122/13 of August 18, 2017

The EL3000 series gas analyzers Limas23 (sample components NO, NOₓ, SO₂) and electrochemical oxygen sensor (sample component O₂) are certified for use in combustion plants according to Directive 2010/75/EU Chapter III (formerly Directive 2001/80/EG, 13th BImSchV), waste incineration plants according to Directive 2010/75/EU Chapter IV (formerly Directive 2000/76/EG, 17th BImSchV) and other plants requiring official approval. The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.


The EL3000 Series gas analyzer Fidas24 (sample component C-total) is certified for use in combustion plants according to Directive 2010/75/EU Chapter III (formerly Directive 2001/80/EG, 13th BImSchV), waste incineration plants according to Directive 2010/75/EU Chapter IV (formerly Directive 2000/76/EG, 17th BImSchV) and other plants requiring official approval. The requirements of QAL1 according to EN 15267 and EN 14181 are fulfilled.


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 and
2014/34/EU ATEX directive (version in category 3G for measurement of non-flammable gases and vapors).

SIL conformity


Approval for USA and Canada – CSA

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

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
Pattern approval certificate for Russia No. Д.Е.С.31.004.A No. 37984.

Explosion protection to European standards

Designation: Ⅱ 3G Ex nA nC IIC T4 Gc
Type Examination Certificate No. BVS 16 ATEX E 085 X