EasyLine Continuous Gas Analyzers

Model EL3020

Data Sheet

10/24-4.10 EN November 2005

- Detectors with different measurement principles for numerous process and emission monitoring applications
- Up to five measurement components per gas analyzer
- Suitable for measuring flammable gases
- Automatic calibration including pump and valve control
- Simplified calibration with air or integral calibration cells eliminating the need for test gas cylinders
- Customizable analog outputs, digital inputs and outputs
- Modbus interface
- Integral gas feed (optional)
- Simple menu-driven operator interface
- Clear-text status messages
- Configuration of rarely required functions with included configuration program
- Housing version for 19-inch rack mounting (3 height units, IP20)
- Modular design for ease of service
- Self-monitoring function indicates when maintenance is required

Contents

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, SO_2
- Magnos206 oxygen analyzer for the measurement of O_2 in process gas or in N_2
- Caldos27 thermal conductivity analyzer for the measurement of binary gas mixtures with different thermal conductivity e.g. Ar in O_2, H_2 in Ar, CH_4 in N_2
- Electrochemical oxygen sensor for the measurement of O_2

The electrochemical oxygen sensor can only be used in combination with the Uras26 infrared photometer.

The Magnos206 oxygen analyzer and the Caldos27 thermal conductivity analyzer can also be used in combination with the Uras26 infrared photometer.

Integral Gas Feed

The integral gas feed (option) is available in two versions. It either includes

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

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 service and configuration purposes)

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

- Analog output module with 2 analog outputs,
- Digital I/O module with 4 digital inputs and 4 digital outputs and
- Modbus module with RS485 and RS232 interfaces.

Housing Design

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

Note Regarding the Performance Characteristics of the Analyzers

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

Measurement Principle

Non-dispersive infrared absorption in the λ = 2.5–8 μm wavelength range

Photometer to measure up to 4 components with 1 or 2 beam paths and 1 or 2 receivers per beam path in one gas path or two separate gas paths.

Sample Components and Measurement Ranges

The analyzer has one physical measurement range per sample component. The smallest measurement ranges are shown in the following table.

Sample Component	Smallest Measurement Range
CO	0–100 ppm
CO_2	0–100 ppm
NO	0–150 ppm
SO_2	0–100 ppm
N_2O	0–100 ppm
CH_4	0–100 ppm

Measurement Range Limits
0–500 (NO: 750) / 1000 / 3000 ppm, 0–1 / 3 / 10 / 30 / 100 Vol.-%
The measurement ranges are freely adjustable within a range ratio of max. 1:5. An individual measurement range can be factory-set on request. 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.

Linearity Deviation
≤ 1 % of span

Repeatability
≤ 0.5 % of span

Zero Drift
≤ 1 % of span per week

Sensitivity Drift
≤ 1 % of measured value per week

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

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

Influence Effects

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

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

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

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

The pressure sensor is located in the sample gas path if hoses are used as the internal gas lines.
If tubing is used for internal gas lines the pressure sensor is routed to the outside via a hose.
Pressure sensor working range: p_{abs} = 600–1250 hPa

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

Calibration

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

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

Materials in Contact with the Sample Medium

Analyzer (Sample Cells)
Tubing: Aluminum; Window: CaF_2 or BaF_2; Connectors: Stainless steel 1.4305

Gas Lines and Connectors
FPM (Fluorocarbon rubber) hoses, PVDF connectors; Option: Stainless steel tubes 1.4571, stainless steel connectors 1.4305

Gas Inlet Conditions

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

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

Inlet Pressure
p_e = 2–500 hPa
Lower pressures require a sample gas pump and higher pressures require a pressure reducer.

Outlet Pressure
Atmospheric pressure

Flow Rate
20–100 l/h

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

Flammable Gases
In the version with gas lines and connectors made of stainless steel the analyzer is suitable for measuring flammable gases in general purpose environment. Please observe the special conditions (see operator's manual).

Gas Connections
see page 16

Measurement Principle

Paramagnetic behavior of oxygen

Magnetomechanical oxygen analyzer; short 90% response time

Sample Component and Measurement Range

Sample Component
Oxygen (O_2)

Smallest Measurement Range
0–2 Vol.-% O_2

Measurement Range Limits
The measurement range limits are freely adjustable; they are factory-set per order to 0–100 Vol.-% O_2 or 98–100 Vol.-% O_2.

Largest Measurement Range
0–100 Vol.-% O_2
Measurement ranges should not be set within ignition limits.

Measurement Ranges with Suppressed Zero-Point
Smallest span 2 Vol.-% O_2. The suppressed measurement range is factory-set to 98–100 Vol.-% O_2. A pressure sensor is installed when the analyzer has been ordered with suppressed measurement range.

Stability

The following data apply only if all influence factors (e.g. flow rate, temperature, atmospheric pressure) are constant. They are based on a span of 2 Vol.-% O_2.

Linearity Deviation
≤ 0.5 % of span

Repeatability
≤ 1 % of span (time base for gas exchange 3 minutes)

Zero Drift
≤ 0.1 Vol.-% O_2 per week; following prolonged transport and storage time the drift can be higher during the first weeks of operation.

Sensitivity Drift
≤ 0.1 Vol.-% O_2 per week or ≤ 1 % of measured value per week (not cumulative), whichever is smaller.

Output Fluctuation (2 σ)
≤ 0.5 % of smallest measurement range span at electronic T90 time (static/dynamic) = 3/0 sec

Detection Limit (4 σ)
≤ 1 % of smallest measurement range span at electronic T90 time (static/dynamic) = 3/0 sec

Influence Effects

Flow Effect
≤ 0.1 Vol.-% O_2 in the 30–90 l/h range

Associated Gas Effect
The effect of associated gases as a shift of the zero-point – expressed in Vol.-% O_2 – can be estimated using the approximate values in the following table:

Associated Gas Concentration 100 Vol.-%		Zero-Point Shift in Vol.-% O_2
Hydrogen	H_2	+0.28
Hydrogen Sulfide	H_2S	–0.45
Argon	Ar	–0.26
Helium	He	+0.30
Neon	Ne	+0.13
Nitrogen	N_2	0
Nitrogen Oxide	NO	+43
Nitrogen Dioxide	NO_2	+28
Nitrous Oxide	N_2O	–0.20
Carbon Monoxide	CO	–0.01
Carbon Dioxide	CO_2	–0.32
Carbon Oxysulfide	COS	–0.90
Ethane	C_2H_6	–0.46
Ethylene	C_2H_4	–0.29
Methane	CH_4	–0.24
Propane	C_3H_8	–0.98
Propylene	C_3H_6	–0.55
Trichloroethane	C_2HCl_3	–2.17
Vinyl Chloride	CH_2CHCl	–0.75

For further associated gases refer to EN 61207-3

Temperature Effect
Ambient temperature in the permissible range
– At zero-point: ≤ 1 % of span per 10 °C, ≤ 2 % of span per 10 °C in combination with Uras26
– On sensitivity: ≤ 0.2 % of measured value per 10 °C
Thermostat temperature = 64 °C

Air Pressure Effect
– At zero-point: No effect
– On sensitivity with no pressure correction:
≤ 1 % of measured value per 1 % air pressure change
– On sensitivity with pressure correction using integrated pressure sensor (optional):
≤ 0.01 % of measured value per 1 % pressure change or
≤ 0.002 Vol.-% O_2 per 1 % pressure change, whichever is greater
Pressure sensor working range: p_{abs} = 600–1250 hPa

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

Position Effect
Zero-point shift ≤ 0.05 Vol.-% O_2 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
$T_{90} \leq 4$ sec at a sample gas flow of 90 l/h and electronic T90 time (static/dynamic) = 3/0 sec, gas change from N_2 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
For measurement ranges from 0 to 5 Vol.-% O_2 to 0 to 25 Vol.-% O_2
Zero-point calibration with any oxygen concentration, e.g. with nitrogen (N_2) or ambient air, processed through a cooler or H_2O absorber; sensitivity deviation ≤ 0.05 Vol.-% O_2 per year.
Pressure correction by means of pressure sensor is recommended for single-point calibration with air.
Depending on the measurement task involved, the zero- and end-points should be verified periodically.

Calibration of Measurement Ranges with Suppressed Zero-Point
Highly suppressed measurement ranges (≥95–100 Vol.-% O_2) 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, glass, platinum, rhodium, epoxy resin;
Seals: FPM (Fluorocarbon rubber), PEEK

Gas Inlet Conditions

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

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

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

Outlet Pressure
Atmospheric pressure

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

Corrosive Gases
Consultation with ABB Analytical is required if the sample gas contains Cl_2, HCl, HF or other corrosive components.
The AO2000-Magnos106 analyzer should be used if the sample gas contains NH_3.

Flammable Gases
The analyzer is suitable for measuring flammable gases in general purpose environment. Please observe the special conditions (see operator's manual).

Gas Connections
see page 17

Measurement 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 Meas. Range	Smallest Meas. Range With Suppr. Zero-Point
Air in Ar	0– 6 Vol.-%	94–100 Vol.-%
Ar in air	0– 6 Vol.-%	94–100 Vol.-%
Air in CO_2	0–10 Vol.-%	90–100 Vol.-%
CO_2 in air	0–10 Vol.-%	90–100 Vol.-%
Air in H_2	0– 3 Vol.-%	–
H_2 in air	0– 1 Vol.-%	–
Air in He	0– 3 Vol.-%	98–100 Vol.-%
He in air	0– 2 Vol.-%	97–100 Vol.-%
Ar in CO_2	–	50–100 Vol.-%
CO_2 in Ar	0–50 Vol.-%	–
Ar in H_2	0– 3 Vol.-%	99–100 Vol.-%
H_2 in Ar	0– 1 Vol.-%	97–100 Vol.-%
Ar in He	0– 3 Vol.-%	99–100 Vol.-%
He in Ar	0– 1 Vol.-%	97–100 Vol.-%
Ar in N_2	0– 6 Vol.-%	94–100 Vol.-%
N_2 in Ar	0– 6 Vol.-%	94–100 Vol.-%
Ar in O_2	0–10 Vol.-%	90–100 Vol.-%
O_2 in Ar	0–10 Vol.-%	90–100 Vol.-%
CH_4 in H_2	0– 3 Vol.-%	99–100 Vol.-%
H_2 in CH_4	0– 1 Vol.-%	97–100 Vol.-%
CH_4 in N_2	0– 6 Vol.-%	94–100 Vol.-%
N_2 in CH_4	0– 6 Vol.-%	94–100 Vol.-%
CO in H_2	0– 3 Vol.-%	99–100 Vol.-%
H_2 in CO	0– 3 Vol.-%	99–100 Vol.-%
CO_2 in H_2	0– 3 Vol.-%	99–100 Vol.-%
H_2 in CO_2	0– 1 Vol.-%	97–100 Vol.-%
CO_2 in N_2	0–10 Vol.-%	90–100 Vol.-%
N_2 in CO_2	0–10 Vol.-%	90–100 Vol.-%
H_2 in N_2	0– 1 Vol.-%	97–100 Vol.-%
N_2 in H_2	0– 3 Vol.-%	99–100 Vol.-%
H_2 in NH_3	0–10 Vol.-%	90–100 Vol.-%
NH_3 in H_2	0–10 Vol.-%	90–100 Vol.-%
He in N_2	0– 2 Vol.-%	97–100 Vol.-%
N_2 in He	0– 3 Vol.-%	98–100 Vol.-%

Measurement Ranges for Monitoring Hydrogen-Cooled Turbo Generators

Sample Component and Associated Gas	Measurement Range
CO_2 in air or Ar in air	0–100 Vol.-%
H_2 in CO_2 or H_2 in Ar	100–0 Vol.-%
H_2 in air	100–80 Vol.-%

Other sample components on request.

Measurement Range Limits
Ranges are freely adjustable within the range limits given 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 smallest measurement ranges given in the table. The deviations may be larger for smaller measurement ranges.

Linearity Deviation
≤ 2 % of span

Repeatability
≤ 1 % of span

Zero Drift
≤ 2 % of smallest possible measurement range per week

Sensitivity Drift
≤ 0.5 % of smallest possible measurement range per week

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

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

Influence Effects

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

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

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

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

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

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

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

Dynamic Response

Warm-Up Time
Approx. 30 minutes

90% Response Time
$T_{90} \leq 2$ sec at sample gas flow of 60 l/h and electronic T90 time (static/dynamic) = 0/0 sec

Calibration

Zero-Point Calibration
With test gas, measurement component-free process gas or substitute gas

End-Point Calibration
With test gas, process gas having a known sample gas concentration or substitute gas

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

Materials in Contact with the Sample Medium

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

Gas Inlet Conditions

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

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

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

Outlet Pressure
Atmospheric pressure

Flow Rate
Normally 10–90 l/h, minimum 1 l/h

Pressure Drop
< 2 hPa at 60 l/h N_2

Corrosive Gases
Consultation with ABB Analytical is required if the sample gas contains Cl_2, HCl, HF, SO_2, NH_3, H_2S or other corrosive components.

Flammable Gases
The analyzer is suitable for measuring flammable gases in general purpose environment. Please observe the special conditions (see operator's manual).

Gas Connections
see page 17

Electrochemical Oxygen Sensor

Measurement Principle

Electrochemical oxygen sensor

Sample Component and Measurement Range

Sample Component
Oxygen (O_2)

Smallest Measurement Range
0–5 Vol.-% O_2

Measurement Range
Adjustable from 0–5 Vol.-% O_2 to 0–25 Vol.-% O_2

Stability

Linearity Deviation
Linear in the range > 1 Vol.-% O_2

Repeatability
≤ 0.5 % of span

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

Sensitivity Drift
≤ 1 % of the measurement range per week

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

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

Influence Effects

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

Temperature Effect
Ambient temperature in the +5 to +40 °C range:
≤ 0.2 Vol.-% O_2 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
T_{90} ≤ 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.-% O_2

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

Gas Inlet Conditions

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

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

Moisture Content
H_2O dew point ≥ 2 °C
The oxygen sensor should not be used with dry sample gas.

Inlet Pressure
p_e = 2–500 hPa

Outlet Pressure
Atmospheric pressure

Flow Rate
20–100 l/h

Associated Gas
The oxygen sensor should not be used if the associated gas contains the following components: H_2S, chlorine or fluorine compounds, heavy metals, aerosols, mercaptane, base components.

Integral Gas Feed

Fine Filtration

Version
Disposable filter with Borosilicate glass microfiber filter element

Retention Rate
99.99 % for particles > 0.1 µm

Materials in Contact with the Sample Medium
Polyamide, borosilicate glass with PVDF binder

Test Gas Supply

Version
3/2-way solenoid valve

Power Consumption
Approx. 3 W

Materials in Contact with the Sample Medium
PVDF, FPM

Gas Feed

Version
Magnetic piston pump

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

Flow Rate
Adjustable

Power Consumption
Approx. 10 W

Materials in Contact with the Sample Medium
PVDF, EPDM, stainless steel 1.4571

Flow Monitor

Version
Miniature flow sensor

Materials in Contact with the Sample Medium
Al_2O_3, silicon, gold, GFK

Gas Inlet Conditions

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

Temperature
+5 to +45 °C
The sample gas dew point should be at least 5 °C below the temperature throughout the sample gas path. Otherwise a sample gas cooler or condensate trap is required.

Flow Rate
30–60 l/h

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

Housing

Version
19-inch housing (3 height units) for rack-mounting

Protection Type
IP20 per EN 60529

Materials
Housing: Galvanized sheet steel, outer surfaces varnished;
analyzer rear panel: aluminum, PVC-C;
keypad sheet: Polyester

Color
Light gray (RAL 7035), basalt gray (RAL 7012)

Weight
approx. 7–15 kg

Dimensions
See dimensional drawing on page 13

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

Limit Value Monitoring

Limit values can be set using the configuration program.
The limit value signals (alarms) are output via the digital ports.

Pressure Sensor

Use
Standard for Uras26 and Caldos27, option for Magnos206

Materials in Contact with the Sample Medium
Silicon gel, plastics, FPM (Fluorocarbon rubber)

Electromagnetic Compatibility

Noise Immunity
Tested to EN 61326:1997 + A1:1998 + A2:2001 + A3:2003.
Inspection severity: Industrial area, fulfills at least the rating "continuously monitored operation" to Table 2 of EN 61326.

Emitted Interference
Tested to EN 61326:1997 + A1:1998 + A2:2001 + A3:2003, EN 61000-3-2:2000 and EN 61000-3-3:1995 + A1:2001.
Limit value class B for interference field strength and interference voltage is met.

Electrical Safety

Tested per EN 61010-1:2001

Protection Class
I

Overload Category/Pollution Level
Power supply: III/2
Signal inputs and outputs: III/2

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

Mechanical Stress

Operation
Vibration test to EN 60068-2-6:1996
Vibrations up to 0.5g/150 Hz have no influence on the measured value. In Uras26, slight transient effects on the measured value can occur in the region of the beam modulation frequency.

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

Ambient Conditions

Ambient Temperature
Operation: +5 to +45 °C
Uras26 in combination with another analyzer: +5 to +40 °C
Storage and transport: –25 to +65 °C

Relative Humidity
< 75 %, slight condensation allowed

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

Power Supply

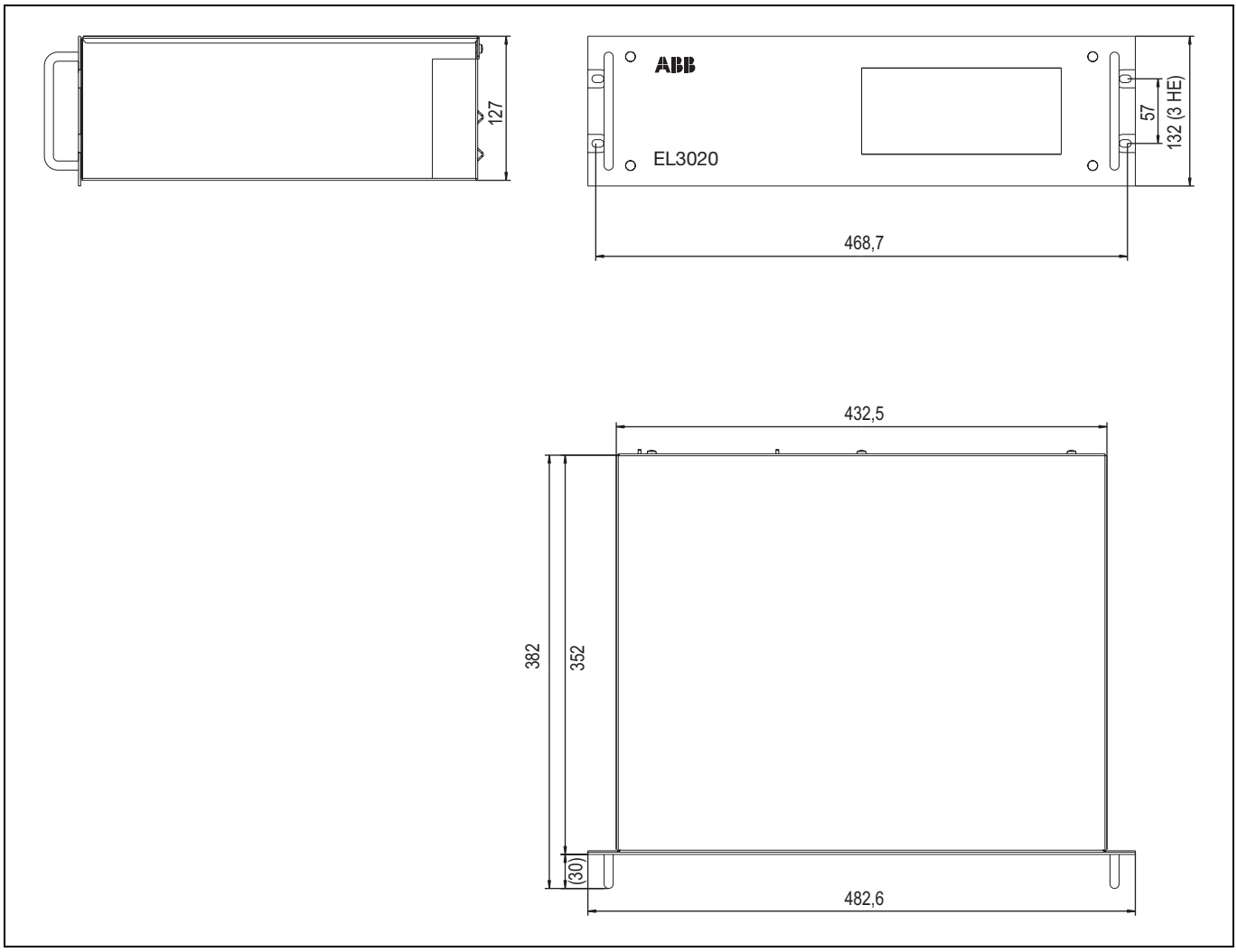
Input Voltage
100–240 V AC (– 15 %, + 10 %) 50–60 Hz (± 3 Hz)

Power Consumption
Max. 187 W

Connection
3-pin plug per EN 60320-1/C14; connection cable supplied, length 2 m

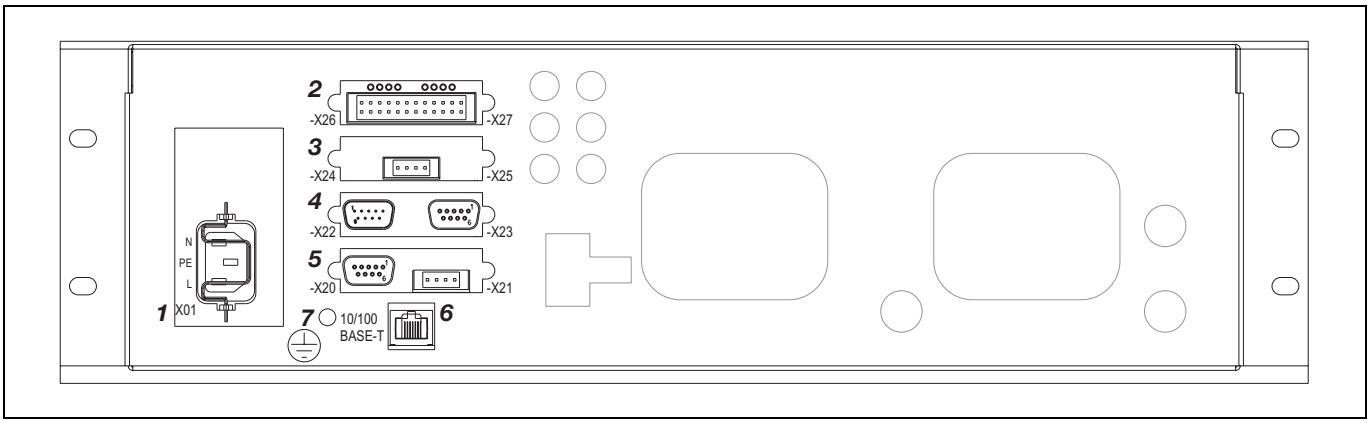
Dimensional Drawing

19-Inch Rack Housing (dimensions in mm)



Electrical Connections

Power Supply and Signal Lines



1 Power Supply Connection
(3-pin plug per EN 60320-1/C14; connection cable supplied, length 2 m)

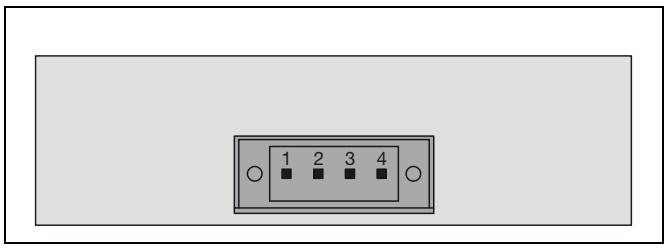
I/O Modules (4 slots, assembly example):

2 Digital I/O Module
3 Analog Output Module
4 RS232/RS485 Module
5 Profibus Module (in preparation)

6 Ethernet-10/100BASE-T Interface (8-pin RJ45 plug)
7 Potential Compensation Connection (M5 internal thread)

Notes Regarding Conductor Section for I/O Module Connection
– The maximum capacity of terminals for stranded or solid conductors is 1 mm^2 (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 mm^2, i.e. the maximum stranded conductor section is 0.5 mm^2. The Weidmüller PZ 6/5 crimping tool must be used for crimping the ferrules.

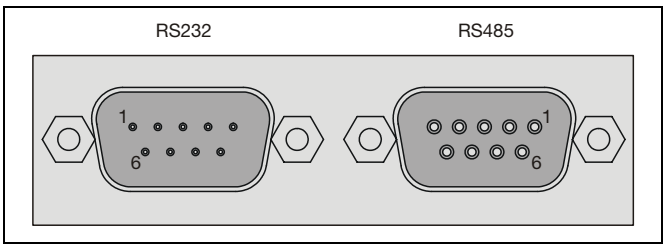
Analog Output Module



Analog Outputs (AO1, AO2)
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.
The output signal cannot be lower than 0 mA.

Electrical Connections
1 AO1+
2 AO1–
3 AO2+
4 AO2–
Design: 4-pin terminal strip for braided or solid conductors with a maximum section of 1 mm^2 (17 AWG). Observe the notes regarding conductor section (see above)!

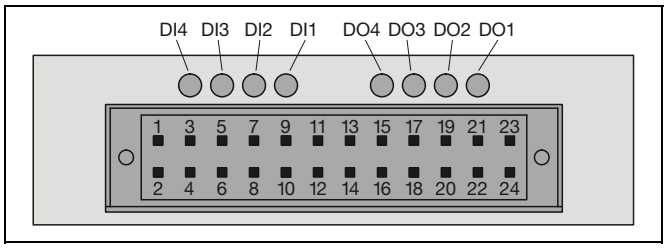
RS232/RS485 Module



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

Digital I/O Module



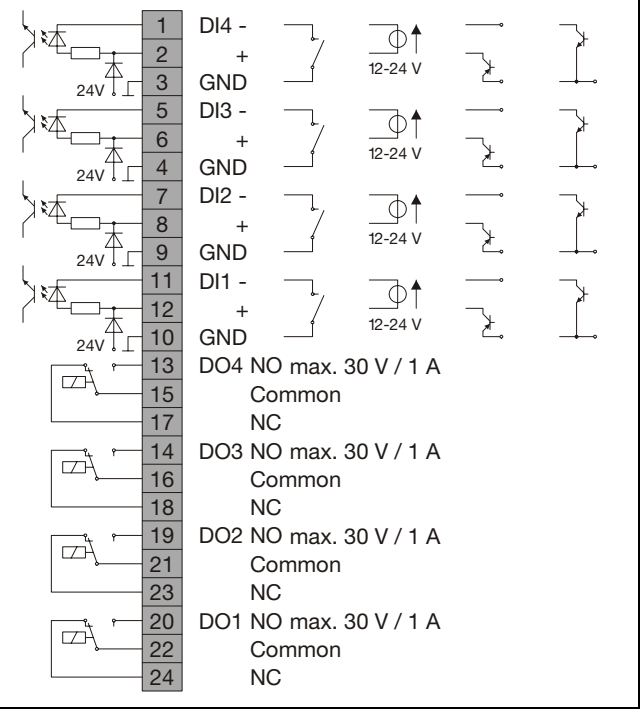
Digital Inputs (DI1 to DI4)
Optocouplers with internal 24 VDC power supply. Control with floating contacts, with external voltage 12–24 VDC or with open collector drivers PNP or NPN.

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

Digital input and output signals	Standard assignment Digital I/O Module 1	2
Error		
Maintenance request		
Maintenance mode		
Overall status	DO1	
Start automatic calibration	DI1	
Stop automatic calibration		
Disable automatic calibration	DI2	
Sample gas valve	DO4	
Zero gas valve		
Span gas valve		
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		
Bus DI 1–8		
External failure	DI3	
External maintenance request	DI4	

Electrical Connections
see connection diagram on the right
Design: 2x12-pin terminal strip for braided or solid conductors with a maximum section of 1 mm^2 (17 AWG). Observe the notes regarding conductor section (see page 14)!

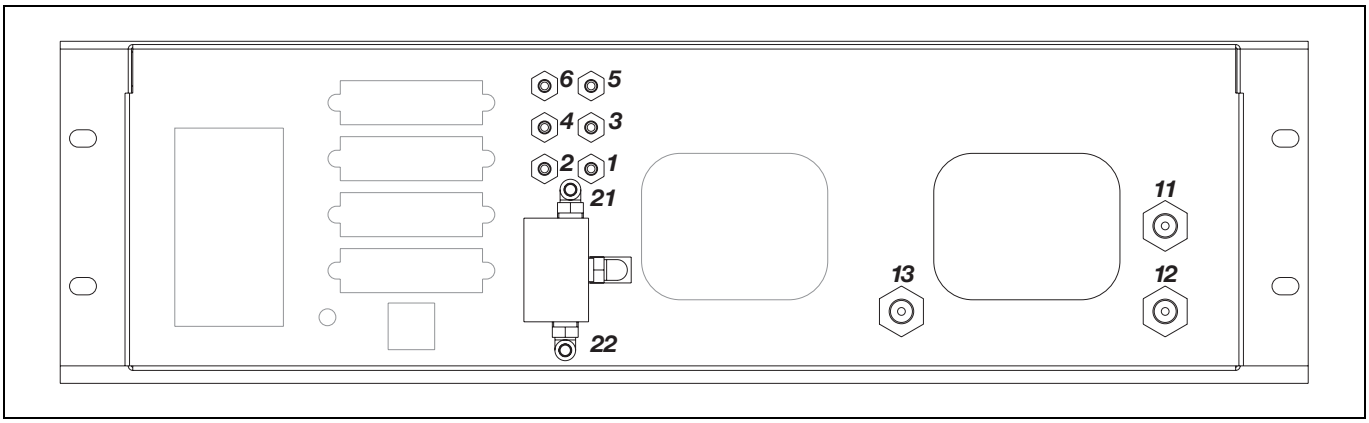
Connection Diagram



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

Gas Connections

Analyzer Uras26



Version with Hose Connections

1	Sample Gas Inlet	Gas Path 1	without “Integral Gas Feeding” option
2	Sample Gas Outlet	Gas Path 1	connected to sample gas inlet of Caldos27 or Magnos206 if applicable
3	Sample Gas Outlet	Integral Gas Feeding	option, factory-connected to ***1*** Sample Gas Inlet Sample Cell 1
4	Sample Gas Inlet	Integral Gas Feeding	option, only with flow sensor (without solenoid valve)
5	Sample Gas Inlet	Gas Path 2	for separate gas paths (for NOx measurement with converter connected upstream)
6	Sample Gas Outlet	Gas Path 2	for separate gas paths
21	Sample Gas Inlet	Integral Gas Feeding	option, with solenoid valve, pump, filter, capillary and flow sensor in gas path 1
22	Test Gas Inlet		at solenoid valve with “Integral Gas Feeding” option

Design: Hose nozzles for hoses with 4 mm inner diameter

Note: In the version with hose connections, pressure sensor (standard) and O_2 sensor (option) are connected internally as follows:
downstream the sample cell 1 outlet for one sample cell or for separate gas paths,
downstream the sample cell 2 outlet for two sample cells in series.

Version with Pipe Connections

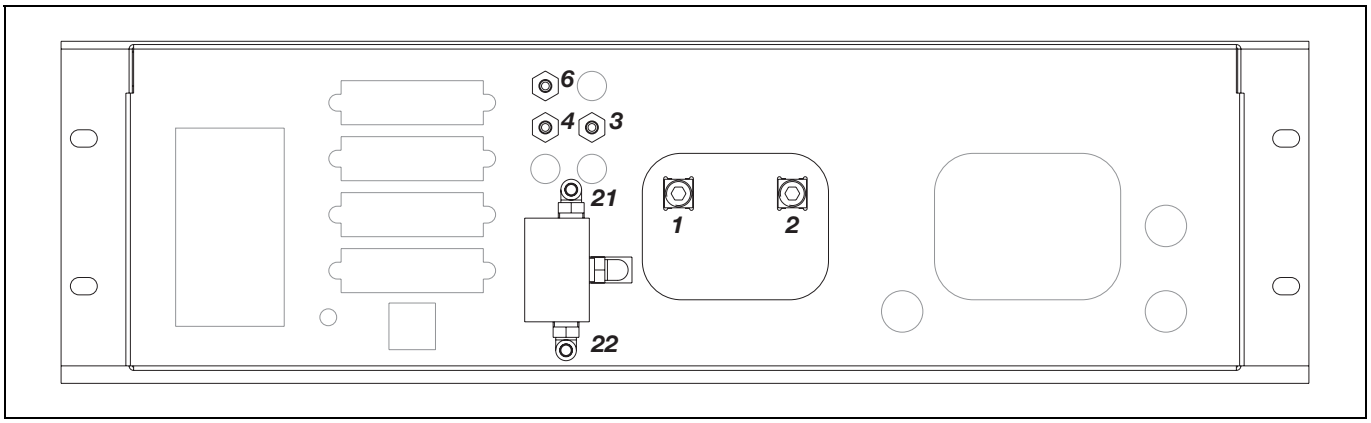
6	Pressure Sensor		
11	Sample Gas Inlet		
12	Sample Gas Outlet	for one sample cell	connected to sample gas inlet of Caldos27 or Magnos206 if applicable
13	Sample Gas Outlet	for two sample cells in series	

Design: 1/8 NPT internal threads for commercially available adapters, e.g. Swagelok®

Note: In the version with pipe connections, O_2 sensor, “Integral Gas Feeding” option and version with two separate gas paths cannot be provided.

Gas Connections

Analyzer Magnos206



Gas Connections

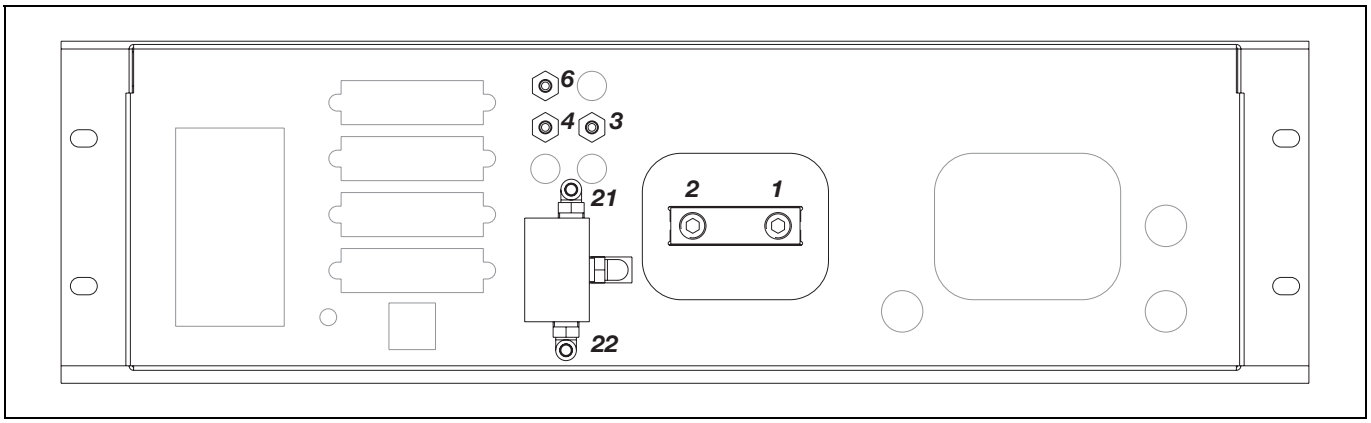
1	Sample Gas Inlet	Direct Connection	
2	Sample Gas Outlet	Direct Connection	

Design: 1/8 NPT internal threads for commercially available adapters, e.g. Swagelok®

3	Sample Gas Outlet	Integral Gas Feeding	option
4	Sample Gas Inlet	Integral Gas Feeding	option, only with flow sensor (without solenoid valve)
6	Pressure Sensor		option
21	Sample Gas Inlet	Integral Gas Feeding	option, with solenoid valve, pump, filter, capillary and flow sensor
22	Test Gas Inlet		at solenoid valve with “Integral Gas Feeding” option

Design: Hose nozzles for hoses with 4 mm inner diameter

Analyzer Caldos27



Gas Connections

1	Sample Gas Inlet
2	Sample Gas Outlet

Design: 1/8 NPT internal threads for commercially available adapters, e.g. Swagelok®

3	Sample Gas Outlet	Integral Gas Feeding	option
4	Sample Gas Inlet	Integral Gas Feeding	option, only with flow sensor (without solenoid valve)
6	Pressure Sensor		
21	Sample Gas Inlet	Integral Gas Feeding	option, with solenoid valve, pump, filter, capillary and flow sensor
22	Test Gas Inlet		at solenoid valve with “Integral Gas Feeding” option

Design: Hose nozzles for hoses with 4 mm inner diameter

Certifications

CE Declaration of Conformity

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

73/23/EC (Low Voltage Directive)
89/336/EC (EMC Directive)

Compliance with the provisions of directive 73/23/EC is evidenced by full compliance with European standard:

EN 61010-1:2001

Compliance with the provisions of directive 89/336/EC is evidenced by full compliance with European standards:

EN 61326:1997 + A1:1998 + A2:2001 + A3:2003,
EN 61000-3-2:2000 and EN 61000-3-3:1995 + A1:2001

Approval for USA and Canada – CSA

The EL3000 Series gas analyzers with housing, integral gas feed and the Uras26, Magnos206 and Caldos27 analyzers are certified for use in general purpose environment, evidenced by full compliance with standard CAN/CSA-C22.2 No. 61010-1-04/ UL 61010-1:2004 (2nd Edition).

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