ABB MEASUREMENT & ANALYTICS | DATA SHEET

EasyLine EL3060

Gas analyzers for use in hazardous areas



Measurement made easy

Intelligently simple, simply intelligent

Comprehensive explosion protection

- Design in explosion protection II 2G or EPL Gb for measuring flammable and non-flammable gases for use in Zone 1 and Zone 2
- Approvals according to ATEX, IECEx

Compact construction

- Flameproof enclosures for the control unit with one analyzer and the Uras26 infrared analyzer
- Combination of two analyzers with up to five measuring components possible

Easy installation

- No purging of the flameproof enclosures
- Easy and safe connection without opening the flameproof enclosures (Ex-d factory wiring)

Easy handling

- Safe operation by means of touch-sensitive keypads through the glass sight window of the control unit without opening the flameproof enclosure
- Multilingual menu-driven user interface

Simple communication

- Ethernet, Modbus and PROFIBUS interfaces
- Configurable analog outputs and digital inputs and outputs

Overview

Measuring technology – Analyzers

The EL3060 Series includes the following analyzers

- Uras26 infrared photometer for the measurement of infrared-active gas components, such as CO, NO, SO_2
- Magnos28 oxygen analyzer for the measurement of O_2 in operating gas or in N_2
- Caldos27 thermal conductivity analyzer for the measurement of for example Ar in O_2, H_2 in Ar, CH_4 in N_2
- Caldos25 thermal conductivity analyzer for the measurement of for example H_2 in N_2 or air or SO_2 in N_2 or air

as well as the EL3060-CU control unit.

An EL3060 gas analyzer consists of the control unit and one or two analyzers.

Variants

Type	Description
EL3060-CU	Control unit without built-in analyzer (with power supply for a separate analyzer unit)
EL3060-Caldos25	EL3060-CU with built-in Caldos25 analyzer
EL3060-Caldos27	EL3060-CU with built-in Caldos27 analyzer
EL3060-Magnos28	EL3060-CU with built-in Magnos28 analyzer
EL3060-Uras26	Separate analyzer unit with Uras26 for connection to EL3060-CU, Caldos25, Caldos27, or Magnos28

Version for the measurement of gases under overpressure
The standard version of the gas analyzer is capable of measuring flammable and non-flammable gases under atmospheric conditions.

An optional version of the gas analyzer is suitable for measuring non-flammable and flammable gases under overpressure. For permissible sample gas pressure see **Sample gas inlet conditions with overpressure in the sample gas feed path** on page 17.

The “version for measurement of gases under overpressure” must be explicitly ordered and should be appropriately marked on the rating plate.

Properties

Control unit
The housing of the EL3060-CU control unit is designed as a field mount housing of die-cast aluminum in the Ex ‘d’ type of protection (flameproof enclosure) in accordance with IEC / EN 60079-1.
The display and operator control unit is installed behind a glass viewing window on the front of the housing.

A terminal housing in the Ex ‘e’ (Increased Safety) type of protection in accordance with IEC / EN 60079-7 is flange-mounted on the underside of the flameproof housing, in which the terminal strip for the electrical connections is installed. Certified electrical conductor bushings are installed between the interior of the explosion housing and the terminal housing in increased safety.

Caldos25, Caldos27, and Magnos28 analyzers
The Caldos25, Caldos27, and Magnos28 analyzers are built into the flameproof housing of the control unit.

Only one of the analyzers can be installed at a time.

Uras26 analyzer
The housing of the Uras26 analyzer is designed as a cylindrical field mount housing made of die-cast aluminum with Ex ‘d’ (flameproof enclosure) type of protection in accordance with IEC / EN 60079-1.

The data transmission cable and the power supply cable for connection to the control unit are permanently connected at the factory and guided through flameproof cable glands on the underside of the housing.

Gas connections
All gas connections are guided through flame barriers.

The material of the flame barriers and the pipe fittings is rust-resistant and acid-resistant steel 1.4571.

Housing purge
To protect the electronic assemblies against the ingress of the aggressive atmosphere or corrosive sample gas components, it is possible to purge the flameproof housing with air or nitrogen.

The purge gas is supplied and discharged via two flame barriers, each of which is open on the inner side of the flameproof housing.

Note
Housing purging has no meaning in terms of pressurized enclosure according to IEC / EN 60079-2.

… Overview

Calibration

The Uras26 infrared photometer can be equipped with gas-filled calibration cells as an option; this allows test gas cylinders to be dispensed with to a large extent.

Owing to its very low sensitivity drift, the Magnos28 oxygen analyzer can be routinely calibrated solely at the zero point by means of single-point calibration, provided that the measuring range is more than 0 to 5 vol. % of O_2; nitrogen or ambient air is used for this purpose.

Nitrogen or ambient air is used for this purpose. 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 LCD indicator of the gas analyzer.

Operation

Five touch screen fields accessible through the control unit viewing glass allow safe operation of the gas analyzer without opening the housing. The menu-driven control system is uniform for all gas analyzers.

Control unit

The EL3060-CU control unit performs the following functions:

- Processing and transmitting measured values provided by the analyzer's sensor electronics,
- Calculation of the measured values,
- Controlling device functions, e.g. calibration,
- Display and control functions,
- Communicating with external systems.

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 device configuration using the ECT configuration program, data transmission using the Modbus TCP/IP® protocol (measured values, status signals, control signals) and QAL3 data transmission (optional)

as well as the I/O modules

- PROFIBUS® module with one RS485 and one MBP interface (also in accordance with VDI 4201 Sheet 2),
- Modbus® module with one RS232 and one RS485 interface (also in accordance with VDI 4201 Sheet 3),
- Digital I/O module with four digital inputs and four digital outputs,
- Analog output module with four analog outputs.

A maximum of 3 I/O modules can be integrated in the gas analyzer. The following combinations of I/O modules are allowed, depending on the functional range and order:

- One analog output module and one digital I/O module (standard),
- One analog output module and two digital I/O modules,
- One analog output module, one digital I/O module and either one Modbus module or one PROFIBUS module,
- One Modbus module,
- One PROFIBUS module.

Notes on the metrological data of the analyzer modules

- The metrological data has been determined in accordance with IEC 61207-1:2010 'Expression of performance of gas analyzers – Part 1: General'. They are based on operation at atmospheric pressure (1013 hPa) and nitrogen as the associated gas. Compliance with these characteristics when measuring other gas mixtures can only be assured if their composition is known.
- The physical detection limit is the lower limit of the measurement-related data relative to the measuring range span.
- The drift values may be increased during the first few days after first commissioning as well as after recommissioning following prolonged standstill and storage times.

Uras26 infrared photometer

Measuring principle

Non-dispersive infrared absorption

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

Sample components and measurement ranges

The Uras26 analyzer module has one physical measurement range per sample component. As an option, smaller measuring ranges can be electronically derived from the physical measurement range. The smallest range is measurement range 1.

The smallest measuring ranges specified in the following table refer to the 1st sample component in beam path 1.

Sample component	Smallest class 1 range	Smallest class 2 range	Smallest meas. range Class 2 with calibration cell	Gas group*
CO	0 to 50 ppm	0 to 10 ppm	0 to 50 ppm**	A
CO_2	0 to 50 ppm	0 to 5 ppm	0 to 25 ppm**	A
NO	0 to 150 ppm	0 to 75 ppm	0 to 75 ppm**	A
SO_2	0 to 100 ppm	0 to 25 ppm	0 to 25 ppm**	A
N_2O	0 to 50 ppm	0 to 20 ppm	0 to 50 ppm**	A
CH_4	0 to 100 ppm	0 to 50 ppm	0 to 50 ppm**	A
NH_3	0 to 500 ppm	0 to 30 ppm	—	B
C_2H_2	0 to 200 ppm	0 to 100 ppm	0 to 100 ppm	B
C_2H_4	0 to 500 ppm	0 to 300 ppm	0 to 300 ppm	B
C_2H_6	0 to 100 ppm	0 to 50 ppm	0 to 50 ppm**	B
C_3H_6	0 to 250 ppm	0 to 100 ppm	0 to 100 ppm**	B
C_3H_8	0 to 100 ppm	0 to 50 ppm	0 to 50 ppm**	B
C_4H_{10}	0 to 100 ppm	0 to 50 ppm	0 to 50 ppm**	B
C_6H_{14}	0 to 500 ppm	0 to 100 ppm	0 to 100 ppm**	B
R 134a	0 to 100 ppm	0 to 50 ppm	0 to 50 ppm**	B
SF_6	0 to 2000 ppm	0 to 1900 ppm	0 to 2000 ppm	B
H_2O	0 to 1000 ppm	0 to 500 ppm	0 to 500 ppm	C

* See price information

** The smallest measuring range 1 is shown.

Note
Other sample components on request.

Number of measuring ranges
2 ranges per sample component

Largest measuring range
0 to 100 vol.-% or 0 vol.-% to saturation or 0 vol.-% to LEL
Measuring ranges within ignition limits cannot be provided.

Measuring range ratio
≤ 1:10 to 1:20 depending on sample components

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant. They apply to measurement range 1 in a delivered analyzer module.

Linearity error
≤ 1 % of measuring span

Repeatability
≤ 0.5 % of span

Zero drift
≤ 1 % of the measuring span per week;
for measuring ranges smaller than Class 1 up to Class 2:
≤ 3 % of span per week

Span drift
≤ 1 % of measured value per week

Output signal fluctuation (2 σ)
≤ 0.2 % of span at electronic T_{90}-time:
- 5 s (Class 1) or
- 15 s (Class 2)

Detection limit (4 σ)
≤ 0.4 % of span at electronic T_{90}-time:
- 5 s (Class 1) or
- 15 s (Class 2)

… Uras26 infrared photometer

Influences

Flow effect

Flow rate in the range 20 to 100 l/h:
≤ 1 % of the measuring span at a flow change of 10 l/h

Associated gas effect / Cross-sensitivity

Analyzer calibration should be based on an analysis of the sample gas.
At zero-point:
Installation of interference filters or filter cells, internal electronic cross-sensitivity correction or carrier gas correction for a sample component by other sample components measured with the Uras26.

Temperature effect

Ambient temperature in permissible range.

- At zero point:
  ≤ 1 % of the span per 10 °C; for measuring ranges smaller than Class 1 to Class 2:
  ≤ 2 % of the span per 10 °C;
- on sensitivity with temperature compensation: ≤ 3 % of the measured value per 10 °C
- On sensitivity with thermostat effect (option):
  ≤ 2 % of the measured value per 10 °C.

Thermostat temperature: 61 °C

Air pressure effect

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

Dynamic response

Warm-up time

Approx. 30 minutes without thermostat; approx. 2.5 hours with thermostat

T_{90} time

T_{90} 2.5 s for sample cell length = 200 mm and sample gas flow = 60 l/h, electronic T_{90} time = 0 s

Calibration

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

Note

During calibration of a multi-component analyzer, possible cross-sensitivity and/or carrier gas corrections by internal or external measurement components are switched off. Therefore, corrected measurement components should be calibrated only using a test gas consisting of the measurement component and an inert gas such as nitrogen.

Materials

Analyzer (sample cells)

- Tube: Aluminum or gold-plated aluminum;
- Window: CaF_2, Option: BaF_2;
- Connection socket: Stainless steel 1.4571 (AISI 316Ti)

Gas lines, connectors and flame barriers

Stainless steel 1.4571 (AISI 316Ti)

Oxygen analyzer Magnos28

Measuring principle

Paramagnetic behavior of oxygen
Magnetomechanical oxygen analyzer

Sample components and measurement ranges

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

Number of measuring ranges

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

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

Note

Measurement ranges should not be set within ignition limits.

Measuring ranges with suppressed zero point

Suppressed measuring ranges can be freely adjusted in the range from 0 to 100 vol.-%. The minimum measuring span is 0.5 vol.-%.

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

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant.

Linearity error

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

Repeatability

≤ 50 ppm O_2

Zero drift

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

Span drift

Period	Drift rate
Drift per week	≤ 0.2 % of the measured value
Drift per month	≤ 0.1 % of the measured value
Drift every 3 months	≤ 0.05 % of the measured value
or ≤ 0.01 vol.-% O_2, the greater value applies	

Output signal fluctuation (2 σ)

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

Detection limit (4 σ)

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

… Oxygen analyzer Magnos28

Influences

Flow effect

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

Associated gas effect

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

Temperature effect

Average temperature effect in permissible ambient temperature range:

- At zero point:
  ≤ 0.05 vol. % O_2 per 10 °C
- On sensitivity:
  ≤ 0.3 % of the measured value per 10 °C
- For suppressed measuring ranges
  (if configured at the factory):
  ≤ 0.01 vol.-% per 10 °C in the entire measuring range

Thermostat temperature: 60 °C

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

Air pressure effect

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

Position effect

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

Dynamic response

Warm-up time

2 to 4 h, depending on ambient conditions.
The value may be elevated during first commissioning or after a longer service life.

T_{90}time

T_{90} ≤ 5 s (≤ 6 s in the version for measurement of gases under overpressure) at a sample gas flow = 90 l/h and electronic T_{90}time (static/dynamic) = 3/0 s, gas change from nitrogen to air.

Calibration

Calibration	Test gas
Zero-point calibration	Oxygen-free operating gas or with substitute gas
End-point calibration	Operating gas with a known oxygen concentration or a substitute gas such as dried air.
Single-point calibration	For measuring ranges of ≥ 0 to 5 vol. % to 0 to 25 vol. % O_2: • Zero point calibration with any oxygen concentration, e.g. with nitrogen or ambient air, processed through a cooler or H_2O absorber. • Pressure correction using a pressure sensor is recommended for single-point calibration with air. • Depending on the measurement task involved, the zero point and end point should be verified periodically (recommendation: once a year).
Measurement ranges with suppressed zero-point	• Suppressed measuring ranges should be calibrated for the greatest possible accuracy with high-accuracy purity gases or test gases. • Single-point calibration can also be done within a suppressed measuring range. Zero point gas is recommended as a test gas. For calibration recommendation see the following table.

Calibration recommendation for suppressed measuring ranges

Upper range value	Zero gas point	End point gas
100 vol.-% O_2	N_2	100 % O_2
approx. 21 vol.-% O_2	N_2	Conditioned air or high-purity test gas

Materials

Analyzer

- Sample chamber: stainless steel 1.4305, nickel alloy, glass, PtNi, silicon, gold, PTFE
- Gaskets: FPM, optional: FFKM75

Gas lines, connectors and flame barriers

Stainless steel 1.4305 (AISI 303), 1.4571 (AISI 316Ti)

Thermal conductivity analyzer Caldos27

Measuring principle

Difference in thermal conductivity of various gases

Micromechanical silicon sensor with especially short T_{90} time

Sample components and measurement ranges

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

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

Sample component and associated gas	Meas. range
CO_2 in air	0 to 100 Vol.-%
H_2 in CO_2	100 to 0 Vol.-%
H_2 in air	100 to 80/90 vol.%

Note
Other sample components on request.

Number of sample components
1 to 4 sample components, manual switchover

Measuring range quantity and measuring range limits
2 measurement ranges per sample component.
Measurement ranges are freely adjustable within the limits shown in the table. They are factory-calibrated for the largest possible measurement range.

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

Measuring ranges with suppressed zero point
See the table above for spans

… Thermal conductivity analyzer Caldos27

Stability

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

Linearity error
≤ 2 % of span

Repeatability
≤ 1 % of measuring span

Zero point drift
≤ 2 % of smallest possible measuring range per week

Span drift
≤ 0.5 % of the smallest provided measuring range per week

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

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

Influences

Flow effect
≤ 0.5 to 2.5 % of span at a flow change of 10 l/h. At an identical flow rate for test and sample gases, the flow rate effect is automatically compensated.

Associated gas effect
Analyzer calibration should be based on an analysis of the sample gas.
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 permissible range.
At each point in the measuring range:
≤ 1 % of the measuring span per 10 °C, with respect to the temperature during calibration
Thermostat temperature: 67 °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 Influence Operating height in excess of 2000 m.

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

Dynamic response

Warm-up time
Approx. 30 minutes

T_{90}time
T_{90} ≤ 2 s at sample gas flow = 60 l/h

Calibration

Calibration	Test gas
Zero-point calibration	Sample-component-free process gas or substitute gas
End-point calibration	Test gas, process gas with a known sample gas concentration or substitute gas
Single-point calibration with standard gas	A single-point calibration can be performed with standard gas, since the zero- and end-points will not drift independently due to the sensor principle employed. This technique leaves out safety- related measurements.

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

Materials

Analyzer

- Sample chamber: stainless steel, 1.4305
- Sensor: gold, silicon oxi-nitride
- Gasket: FFKM75 (Perfluoro rubber)

Gas lines, connectors and flame barriers

Stainless steel 1.4305 (AISI 303), 1.4571 (AISI 316Ti)

Thermal conductivity analyzer Caldos25

Measuring principle

Difference in thermal conductivity of various gases

Highly corrosion-resistant heat conductivity analyzer, measuring cell embedded in glass.

Sample components and measurement ranges

The Caldos25 is specifically designed for measurements of corrosive gas components.

Sample components and smallest measurement ranges (examples)

Sample component and associated gas	Smallest measurement range	Reference gas
H_2 in N_2 or air	0 to 0.5 Vol.-%	Air (sealed)
SO_2 in N_2 or air	0 to 1.5 Vol.-%	Air (sealed)

Number of sample components

1 to 3 sample components, manual switchover

Measuring range quantity and measuring range limits

1 measuring range per sample component
The measuring range is factory-set in accordance with customer order.

Largest measuring range

0 to 100 vol. % or 0 vol. % to saturation
Measurement ranges should not be set within ignition limits.

Measuring ranges with suppressed zero point

Span at least 2 vol.%, depending on application

Stability

The following data only applies if all the influence variables (e.g. flow, temperature and air pressure) are constant.

Linearity error

≤ 2 % of span

Repeatability

≤ 1 % of measuring span

Zero point drift

≤ 1 % of span per week

Span drift

≤ 1 % of measured value per week

Output signal fluctuation (2 σ)

≤ 0.5 % of smallest measurement range span at electronic T_{90} time = 0 sec

Detection limit (4 σ)

≤ 1 % of the measuring span of the smallest measuring range at electronic T_{90} time = 0 s

Influences

Flow effect

≤ 1 to 5 % of span at a flow change of ±10 l/h.
At an identical flow rate for test and sample gases, the flow rate effect is automatically compensated.

Associated gas effect

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

Measurement results can be greatly distorted by interfering components in complex (non-binary) gas mixtures.

Temperature effect

Ambient temperature in permissible range

- At each point in the measuring range:
  ≤ 1 % of the measuring span per 10 °C, with respect to the temperature during calibration

Thermostat temperature: 60 °C

Position effect

< 1 % of span up to 10° deviation from horizontal orientation

Dynamic response

Warm-up time

2 to 4 hours, depending on measurement range

T_{90}time

T_{90} = 10 to 20 s; option: T_{90} <6 s

Calibration

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

Materials

Analyzer

Stainless steel 1.4305 (AISI 303), glass

Gas lines, connectors and flame barriers

Stainless steel 1.4305 (AISI 303), 1.4571 (AISI 316Ti)

General data

Housing – Explosion protection

Control unit
(with or without Magnos28, Caldos25, or Caldos27 analyzer)

Version
Flameproof enclosure with a glass viewing window and a flange-mounted junction box

Type of protection
- Housing: Flameproof enclosure ‘d’ per EN 60079-1,
- Connection compartment: Increased safety ‘e’ per EN 60079-7

Housing protection type
IP 65 to EN 60529

Materials
Aluminum, glass

Color
Light gray (RAL 7035)

Weight
Approx. 22 kg

Dimensions
See page 22

Analyzer unit Uras26

Version
Flameproof enclosure (cylinder)

Type of protection
Flameproof enclosure ‘d’ per EN 60079-1

Housing protection type
- IP 65 with O-ring gasket inserted between the housing base and housing (vertical or horizontal installation allowed) or
- IP 54 without O-ring gasket (vertical installation only allowed)

Material
Aluminum

Color
Light gray (RAL 7035)

Weight
approx. 25 kg

Dimensions
See page 24

Housing purge

General
To protect the gas analyzers in corrosive environments or when using corrosive sample or associated gases an option is available to allow the housings of the control unit and the Uras26 analyzer unit to be purged.

Purge gas
Clean instrument air from non-explosive areas or inert gas. The purge gas for purging the Uras26 analyzer unit must not contain any sample gas components.

Purge gas pressure
$p_{abs} \leq 1080$ hPa

Purge gas flow
During operation ≤ 10 l/h

Pressure drop at the flame barriers
approx. 20 hPa at flow rate of 10 l/h

Operation

LCD display
Backlit graphics display with 240 x 160 pixel resolution

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

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

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

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

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

Measuring range switchover and feedback
There are three ways of executing the measuring range switch-over:
- manually on the gas analyzer,
- automatically by means of appropriate configured switchover 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 se- lected type of measuring range switch-over.
The gas analyzer is set ex works to measuring range 2 and to manual measuring range switchover.

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

Pressure sensor

Use
Standard equipment in the Uras26 and Caldos27, optional in the Magnos28.

The pressure sensor measures the air pressure inside the housing as standard. Optionally, the connection of the pressure sensor can be routed externally on a flame barrier. The pressure sensor must not be connected to the sample gas path when measuring flammable and corrosive gases.

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

Materials
Silcone gel, plastic, FPM;
Flame barrier: Stainless steel 1.4571 (AISI 316Ti)

… General data

Sample gas inlet conditions under atmospheric conditions

Sample gas composition

The standard version of the gas analyzer is capable of measuring flammable and non-flammable gases under atmospheric conditions which can form an explosive environment.

The maximum oxygen content of the sample gas mixture should be 21 vol.%, in accordance with atmospheric conditions.

If the sample gas is a mixture only of oxygen and flammable gases and vapors, it must not be explosive under any conditions. As a rule, this can be achieved by limiting the oxygen content to a maximum of 2 vol.%.

Flammable gases which are potentially explosive under the conditions applicable for the analysis, even without the presence of oxygen, may only be contained in the mixture to be analyzed in non-safety-critical concentrations.

The gas analyzer may not be used for measuring gases that attack the materials of the wetted parts (e.g. gases containing chlorine).

Sample gas input and output conditions

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.

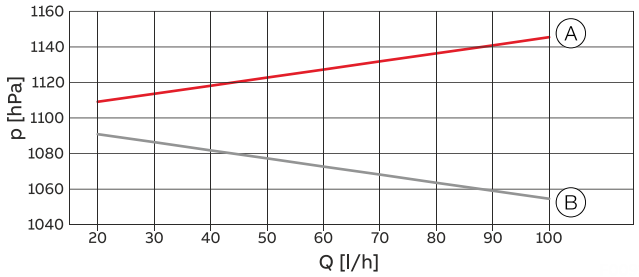
Water vapor content variations cause volume errors.

Pressure in the sample gas path

Measured gas	Permissible inlet pressure
Occasionally explosive mixture (Zone 1 equivalent)	Absolute pressure maximum 1.1 bar (1100 hpa) Overpressure to the atmosphere max. 100 hPa

Because of the pressure drop at the flame barrier, this can be achieved by:

- Maintaining max. 100 hPa overpressure (max. 1100 hPa absolute pressure) at the sample gas inlet.



Ⓐ Maximum inlet pressure Ⓑ Maximum outlet pressure

p Pressure Q Flow rate

Figure 1: Inlet and outlet pressure under atmospheric conditions

Flow rate

Analyzer	Sample gas flow
Uras26	20 to 100 l/h
Magnos28	30 bis 90 l/h
Caldos25, Caldos27	max. 100 l/h

Total pressure drop in the sample gas path

2 × flame barrier + pressure drop in the analyzer:
Approx. 45 hPa at a flow rate of 50 l/h

For other flow rates the pressure drop can be determined from the pressure difference between the maximum inlet and outlet pressure in Figure 1.

Outlet pressure

The outlet pressure must be the same as the atmospheric pressure.

Sample gas inlet conditions with overpressure in the sample gas feed path

Housing designs

Control unit with Magnos28 or Caldos25 or Caldos27 analyzer

The control unit housing must be equipped with a vent if one of the analyzers is installed in the control unit.

Analyzer unit Uras26

The analyzer unit housing must be equipped with two vents. The “flowing reference gas” or “separated gas paths” options are not possible.

Sample gas composition

A special version of the gas analyzer is suitable for measuring gases in Zone 1 under overpressure.

If the sample gas consists of non-flammable gases and vapors, the oxygen content may be max. 21 vol.% in accordance with atmospheric conditions.

If the sample gas consists solely of oxygen and flammable gases and vapors, it is generally not potentially explosive if the oxygen content is safely limited to max. 2 vol.%.

Flammable gases which are potentially explosive under the conditions applicable for the analysis, even without the presence of oxygen, may only be contained in the mixture to be analyzed in non-safety-critical concentrations.

The gas analyzer may not be used for measuring gases that attack the materials of the wetted parts (e.g. gases containing chlorine).

Sample gas inlet and outlet conditions for Uras26, Magnos28, Caldos25, Caldos27 analyzers

Temperature

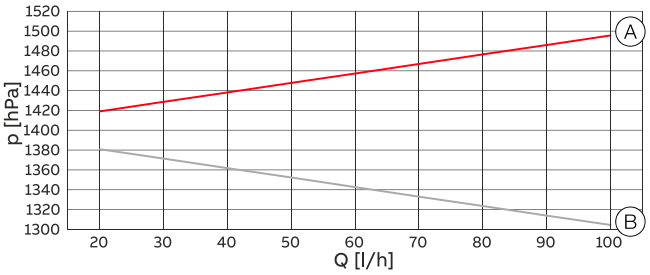
5 to 50 °C

Pressure in the sample gas path

Measured gas	Permissible inlet pressure
Occasionally explosive mixture (Zone 1 equivalent)	Absolute pressure maximum 1.4 bar (1400 hpa) Overpressure to the atmosphere max. 400 hPa

Because of the pressure drop at the flame barrier at the sample gas inlet, this can be achieved by

- Maintaining max. 400 hPa overpressure (max. 1400 hPa absolute pressure) at the sample gas inlet.
- Maintaining the pressure limits for the sample gas inlet and -outlet in accordance with Figure 2.



Ⓐ Maximum inlet pressure Ⓑ Maximum outlet pressure

p Pressure Q Flow rate

Figure 2: Inlet and outlet pressure under overpressure

Flow

- For Magnos28, Caldos25, Caldos27:
  Max. 80 l/h (in the event of an error, e. g. broken piping, from the sides of the sample gas inlet and sample gas outlet).
- For Uras26:
  Max. 100 l/h (in the event of an error, e. g. broken piping, from the sides of the sample gas inlet and sample gas outlet).

… General data

Power supply

Electrical Data

Input voltage

100 to 240 V AC, 50 to 60 Hz, ±3 Hz

Power

Maximum 187 VA

Battery

Application

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

Type

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

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

Safety

In accordance with EN 61010-1

Protection class

Protection class I

Overvoltage category

II

Pollution degree

2

Safe isolation

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

Electromagnetic compatibility

In accordance with EN 61326-1

Noise immunity

Testing accuracy: Industrial area, fulfills at least the evaluation criteria in accordance with Table 2 of EN 61326-1.

Emitted interference

Limit value class A for interference field strength and interference voltage is met.

Mechanical stress

Operation

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

Transport

Vibration test per EN 60068-2-6, shock test per EN 60068-2-27
In its original packaging, the gas analyzer withstands normal shipping conditions.

Requirements for the installation site

Installation location
The gas analyzer is only intended for installation indoors; it may not be installed outdoors.
The installation site must be stable enough to bear the weight of the gas analyzer!

Climatic Conditions
Air Pressure
Atmospheric conditions

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

Relative humidity
Maximum 75 %, slight condensation allowed

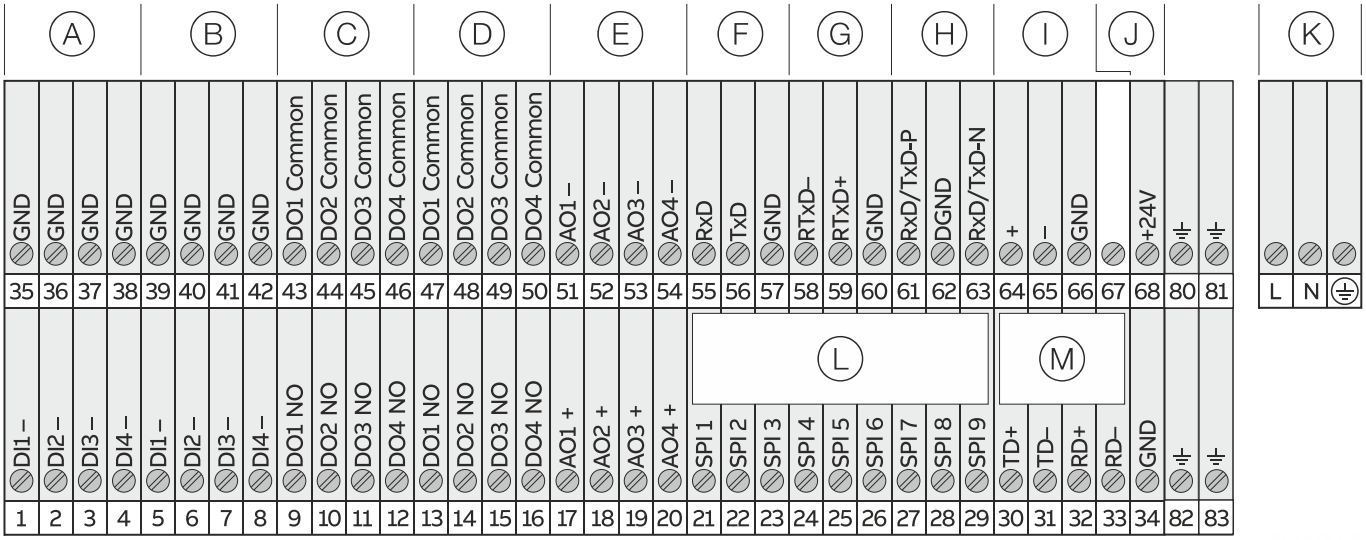
Ambient temperature
- Control unit without / with built-in analyzer:
  5 to 50 °C
- Uras26 without / with a different analyzer:
  5 to 45 °C

Note
The gas analyzer may only be switched on at an ambient temperature of > −10 °C.
After completing the warm-up phase, the explosion protection is not impaired if the gas analyzer is operated at temperatures between 5 and −20 °C.
However in this temperature range the compliance with the metrological data cannot be guaranteed.

Transport-/Storage temperature
−25 to 65 °C

Electrical connections

Terminal assignment



- (A) Digital inputs Digital I/O module 1
- (B) Digital inputs Digital I/O module 2
- (C) Digital outputs Digital I/O module 1
- (D) Digital outputs Digital I/O module 2
- (E) Analog outputs
- (F) Modbus RS232 interface
- (G) Modbus RS485 interface
- (H) PROFIBUS RS485 interface
- (I) PROFIBUS MBP
- (J) 24 V DC power supply for EL3060-Uras26
- (K) Power supply 100 to 240 V AC
- (L) Data transmission EL3060-Uras26
- (M) Ethernet interface

Figure 3: Assignment of terminals in the terminal compartment of the control unit

Note
Not all signal inputs and outputs are actually used, depending on the configuration of the gas analyzer.

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

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

Digital outputs
- Potential-free changeover contacts, maximum contact load capacity 30 V/1 A.
- Relays must at all times be operated within the specified data range.
- Inductive or capacitive loads are to be connected with suited protective measures (self-induction recuperation diodes for inductive loads and series resistors for capacitive loads).

Modbus®, PROFIBUS®
Either the Modbus module* or the PROFIBUS module** can be installed in the gas analyzer as an option.

* You will find detailed information regarding Modbus in the 'COM/EL3000/MODBUS' interface description.

** You will find detailed information regarding PROFIBUS in the '30/24-415' technical information.

Ethernet interface
The Ethernet 10/100BASE-T interface of the gas analyzer is intended for
- communication with the ECT Configuration software for device configuration and software update,
- data transfer using Modbus TCP/IP protocol as well as
- QAL3 data transfer if the QAL3 monitoring option is integrated in the gas analyzer.

Design of the electrical connections
Terminal blocks with screw connection

Conductor cross-section:
- Single-core: 0.5 to 4 mm^2
- Stranded: 1.5 to 4 mm^2
- Fine wire: 0.5 to 2.5 mm^2 (only with wire end sleeve)

Standard assignment of digital inputs and digital outputs

Function	Standard assignment* Digital I/O Module 1	Standard assignment* Digital I/O Module 2
Failure		
Maintenance required		
Maintenance mode		
Overall status	**DO1**	
Start automatic calibration	**DI1**	
Stop automatic calibration		
Disable automatic calibration	**DI2**	
Sample gas valve	**DO4**	
Zero point gas valve		
End point gas valves 1 to 5		
Limit 1	**DO2**	
Limit 2	**DO3**	
Limit 3		**DO1**
Limit 4		**DO2**
Limit 5		**DO3**
Limit 6		**DO4**
Limit 7		
Limit 8		
Limit 9		
Limit 10		
Measuring range switch-over		
Measuring range feedback		
Measuring component switch-over		
Measuring component feedback		
Bus-DI 1		
Bus-DI 2		
Bus-DI 3		
Bus-DI 4		
Bus-DI 5		
Bus-DI 6		
Bus-DI 7		
Bus-DI 8		
External failure**	**DI3**	
External maintenance request**	**DI4**	

* Factory set, can be reconfigured during operation (see **Configuration** in operating instruction OI/EL3060).

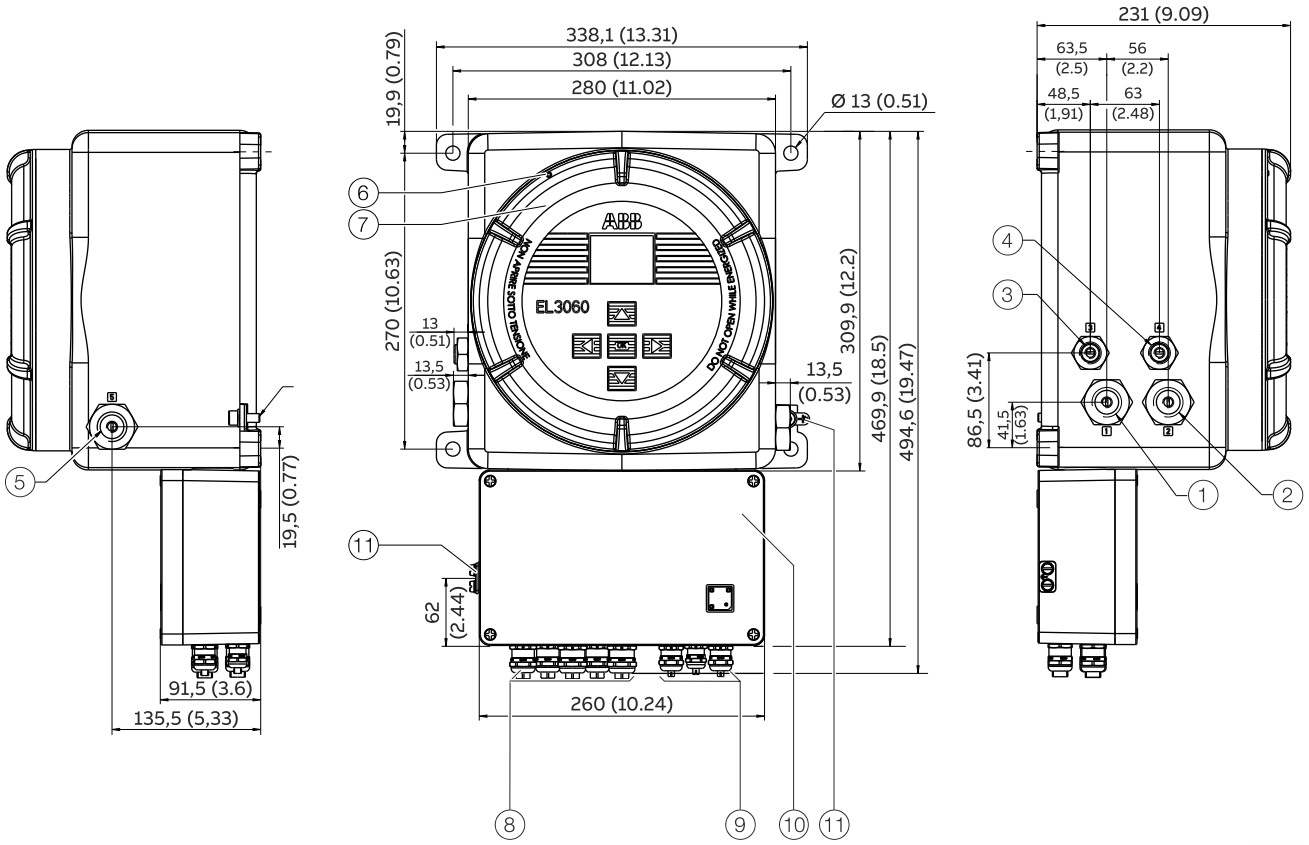
** Multiple external status signals can be configured depending on the number of free digital inputs.

Dimensions and gas connections

EL3060-CU control unit

Standard version (sample gas under atmospheric conditions)

Dimensions in mm (in)



Standard Version

1. Sample gas inlet*
2. Sample gas outlet*
3. Purging gas inlet**
4. Connection of the pressure sensor***
5. Purging gas outlet**
6. Socket-head hex screw for securing the housing cover
7. Housing cover
8. M20 cable glands
9. M16 cable glands
10. Terminal housing with terminal strip (see **Terminal assignment** on page 20)
11. Connection for potential equalization

* If a Magnos28 or Caldos27 or Caldos25 analyzer has been installed in the control unit

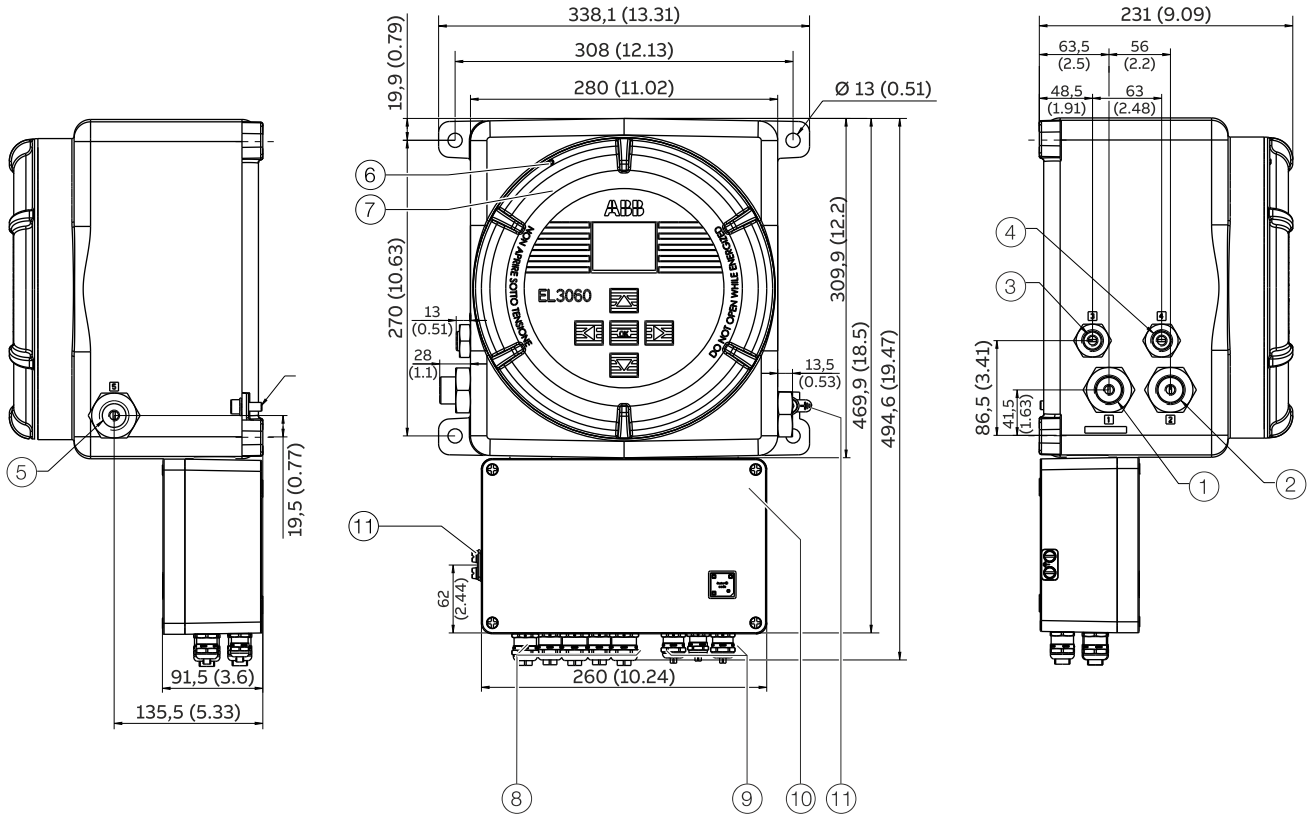
** Option

*** Option. The pressure sensor port (see **Pressure sensor** on page 15) must not be connected to the sample gas path when measuring flammable or corrosive gases.

Figure 4: Dimensions of the EL3060-CU control unit in the standard version

Overpressure version

Dimensions in mm (in)



Design for measuring gases under overpressure

1. Sample gas inlet*
2. Sample gas outlet*
3. Purging gas inlet**
4. Connection of the pressure sensor***
5. Vent* or purging gas inlet**
6. Socket-head hex screw for securing the housing cover
7. Housing cover
8. M20 cable glands
9. M16 cable glands
10. Terminal housing with terminal strip (see **Terminal assignment** on page 20)
11. Connection for potential equalization

* If a Magnos28 or Caldos27 or Caldos25 analyzer has been installed in the control unit

** Option

*** Option. The pressure sensor port (see **Pressure sensor** on page 15) must not be connected to the sample gas path when measuring flammable or corrosive gases.

Figure 5: Dimensions of the EL3060-CU control unit in the overpressure version

Design of the gas connections

Internal flame barriers of rust-resistant and acid-resistant steel 1.4571 with ⅛ NPT female thread.

Note

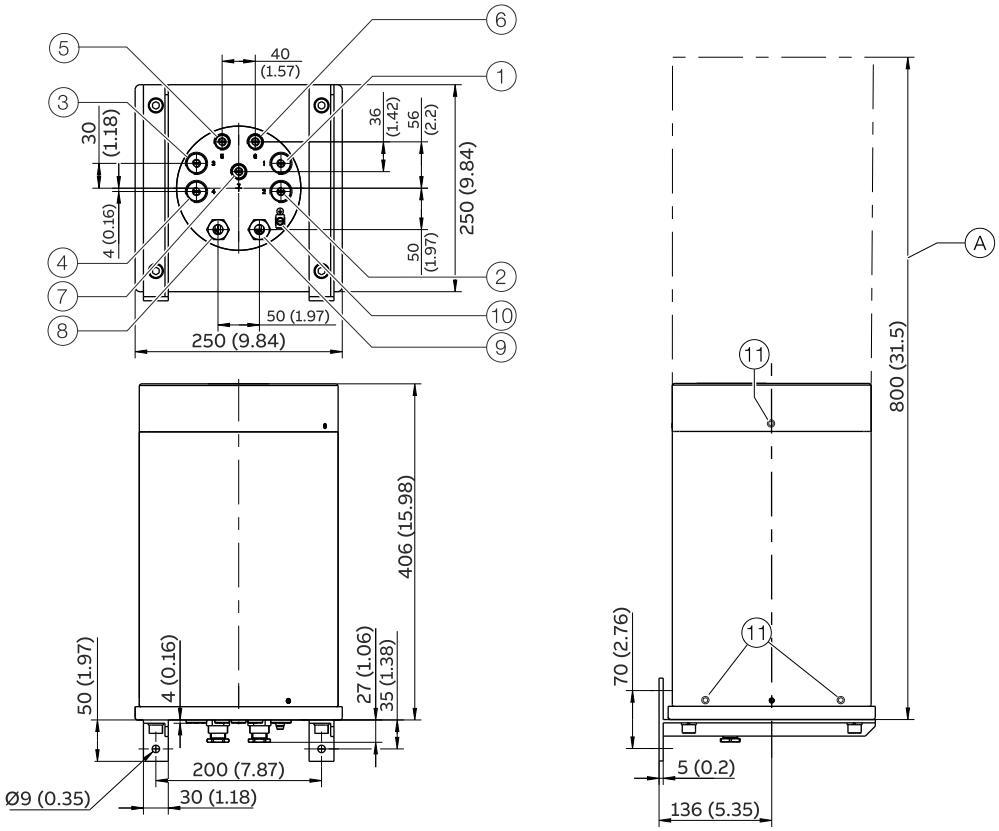
Bear in mind the extra space required for the connection leads under and immediately to the left and right of the control unit (approx. 10 cm in each case).

… Dimensions and gas connections

EL3060-Uras26 Analyzer unit

Standard version (sample gas under atmospheric conditions)

Dimensions in mm (in)



(A) Required space for opening

(1)–(4) See device data sheet for gas connection assignments

(5) Purge gas inlet*

(6) Purge gas outlet*

(7) Connection of the pressure sensor**

(8) Data transmission cable opening

(9) 24 VDC connection cable opening

(10) Connection for potential equalization

(11) Socket-head hex screw for securing the housing cover

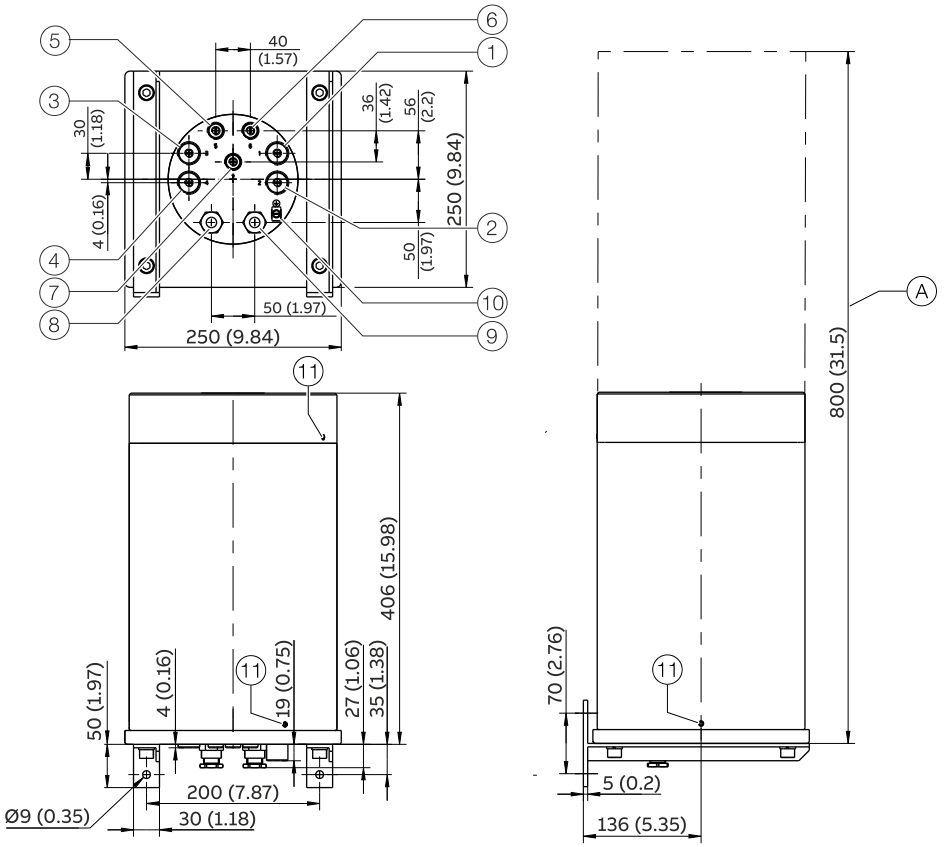
* Option

** The pressure sensor port (see **Pressure sensor** on page 15) must not be connected to the sample gas path when measuring flammable or corrosive gases.

Figure 6: EL3060-Uras26 in the standard version

Overpressure version

Dimensions in mm (in)



Ⓐ Required space for opening

①–④ See device data sheet for gas connection assignments

⑤ Purge gas inlet*

⑥ Purge gas outlet*

⑦ Connection of the pressure sensor**

⑧ Data transmission cable opening

⑨ 24 VDC connection cable opening

⑩ Connection for potential equalization

⑪ Socket-head hex screw for securing the housing cover

* Option

** The pressure sensor port (see **Pressure sensor** on page 15) must not be connected to the sample gas path when measuring flammable or corrosive gases.

Figure 7: EL3060-Uras26 in the overpressure version

Design of the gas connections

Internal flame barriers of rust-resistant and acid-resistant steel 1.4571 with ⅛ NPT female thread

Connection cables

The permanently connected connecting cables for data transmission and 24 V DC supply are integral components of the flame-proof enclosure of the analyzer unit. Both of them are 10 m (33 ft) long and may not be shortened to a length of less than 1 m (3.3 ft).

Note

Note the additional space requirements beneath the analyzer unit for connection leads (approx. 10 cm) and above the analyzer unit for opening the housing Ⓐ (approx. 40 cm).

Approvals and certifications

CE conformity

The EL3060 series gas analyzers satisfy the requirements of the European directives:

- 2014/35/EU Low Voltage Directive,
- 2014/30/EU EMC Directive,
- 2014/34/EU ATEX Directive and
- 2011/65/EU RoHS Directive

SIL conformity

The EL3060-Magnos28 gas analyzer without flow and pressure sensor satisfy the requirements of the European standard for functional safety EN 61508:2010 Part 2 (identical to IEC 61508:2010).

Explosion protection in accordance with the ATEX directive

EL3060 Series gas analyzers with Uras26, Magnos28, Caldos25 and Caldos27 in category 2G for measurement of flammable and non-flammable gases satisfy the requirements of European standards:

- EN 60079-0 (General requirements),
- EN 60079-1 Flameproof enclosure ‘d’ and
- EN 60079-7 Increased safety ‘e’.

Certification in accordance with the ATEX Directive

EL3060-CU control unit (with or without Magnos28, Caldos25, or Caldos27 analyzers)	
EC type examination certificate	BVS 08 ATEX E 048 X
Marking	Ⓔx II 2G Ex db eb IIC T4 Gb

EL3060-Uras26 Analyzer unit	
EC type examination certificate	BVS 08 ATEX E 055 X
Marking	Ⓔx II 2G Ex db IIC T4 Gb

Note

The measuring function in accordance with Directive 2014/34/EU, Annex II, Section 1.5.5 is not the subject of the present EU type examination certificates.

Explosion protection in accordance with IECEx

EL3060 Series gas analyzers with Uras26, Magnos28, Caldos25 and Caldos27 in the version with EPL Gb for measurement of flammable and non-flammable gases satisfy the requirements of IEC standards:

- IEC 60079-0 (General requirements),
- IEC 60079-1 Flameproof enclosure ‘d’ and
- IEC 60079-7 Increased safety ‘e’.

Certification in accordance with IEC standards

EL3060-CU control unit (with or without Magnos28, Caldos25, or Caldos27 analyzers)	
Certificate no.	IECEx BVS 13.0037X
Marking	Ex db eb IIC T4 Gb

EL3060-Uras26 Analyzer unit	
Certificate no.	IECEx BVS 13.0056X
Marking	Ex db IIC T4 Gb

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3KXG112002R1001

DS/EL3060-EN Rev. D 05.2024