EasyLine EL3060

Continuous gas analyzers

Gas analyzers for use in potentially explosive atmospheres

Measurement made easy

EasyLine EL3060

Introduction

The EL3060 series impresses with its integral mount design, which has been specially developed for potentially explosive atmospheres. The flameproof enclosed control unit can accommodate an oxygen analyzer or a thermal conductivity analyzer.

The infrared photometer is built into its own flameproof housing and can be installed separately from the control unit.

The robust design with flameproof enclosure meets the requirements for use in potentially explosive atmospheres of Zone 1, Category 2G according to the European ATEX regulations.

Operation of the device directly through the explosion proof armored glass pane enables safe operation without the need to open the housing.

Additional Information

Additional documentation on EasyLine EL3060 is available for download free of charge at www.abb.com/analytical.
Alternatively simply scan this code:

Table of contents

1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

⚠ DANGER

The signal word '**DANGER**' indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠ WARNING

The signal word '**WARNING**' indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠ CAUTION

The signal word '**CAUTION**' indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

NOTICE

The signal word '***NOTICE***' indicates possible material damage.

Note

'**Note**' indicates useful or important information about the product.

… 1 Safety

Intended use

The gas analyzer is designed for continuous measurement of the concentration of individual components in gases or vapors.

Any other use is not approved.

The intended use also includes taking note of this operating instruction.

The EL3060-Uras26 analyzer unit may only be operated in conjunction with the EL3060-… control unit, see **Control unit** on page 11.

Measurement of flammable gases

The gas analyzer is suited for measuring non-flammable and flammable gases under atmospheric conditions, which can occasionally form a hazardous atmosphere (Zone 1).

The mixing ratio of these gases should be clearly below the lower explosive limit (LEL) or clearly above the upper explosive limit (UEL). Exceptions can include e.g. startup and shutdown conditions.

In a special version and when special conditions are met, the gas analyzer is suited for the measurement of non-flammable and flammable gases under gauge pressure, see **Sample gas inlet conditions with gauge pressure in the sample gas feed path** on page 16.

Important safety instructions

In accordance with the EU Directive 2014/34/EU and the general requirements for explosion protection and as specified in the IEC 60079-0 standard, the scope of approvals for our explosion-protected apparatus is limited to **atmospheric conditions**, unless expressly stated otherwise in the certificates.

This also includes the sample gas that is fed in.

Definition of atmospheric conditions	
Temperature	–20 to 60 °C
Pressure p_{abs}	80 to 110 kPa (0.8 to 1.1 bar)
Ambient air with standard oxygen content, typically 21% vol.%	

If the **atmospheric conditions are not complied with**, the operator is obliged to guarantee the safe operation of our devices in the absence of the recommended atmospheric conditions, by means of further measures (e.g. evaluation of the gas mixture or explosion pressure) and / or supplementary protective devices.

Improper use

The following are considered to be instances of especially improper use of the device:

- For use as a climbing aid, for example for mounting purposes.
- For use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding/soldering on parts.
- Material removal, for example by spot drilling the housing.

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

Safety instructions

Requirements for safe operation

In order to operate in a safe and efficient manner the device should be properly handled and stored, correctly installed and set-up, properly operated and correctly maintained.

Personnel qualifications

Only persons familiar with the installation, set-up, operation and maintenance of comparable devices and certified as being capable of such work should work on the device.

Special information and precautions

These include:

- The content of this operating instruction,
- The safety information affixed to the device,
- The applicable safety precautions for installing and operating electrical devices,
- Safety precautions for working with gases, acids, condensates, etc.

National regulations

The regulations, standards and guidelines cited in this operator's manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the device is used in other countries.

Safety of the equipment and safe operation

The device was built and tested in accordance with EN 61010 Part 1 'Safety regulations for electrical measuring, control and laboratory equipment' and it left the factory in perfect condition.

To maintain this condition and to assure safe operation, read and follow the safety instructions in this operating instruction. Failure to do so can put persons at risk and can lead to device damage as well as damage to other systems and devices.

Potential equalization

- The external potential equalization connections of the control unit and the analyzer unit must be connected to the local potential equalization.
- The local potential equalization must be connected before any other connections are made.
- The connectors have a clamping range of max. 4 mm^2.

Danger of interrupted potential equalization

The device can be hazardous if the protective lead is interrupted inside or outside the device or if the protective lead is disconnected.

⚠ DANGER

Explosion hazard

Explosion hazard when working on the potential equalization or the potential equalization connection in an existing hazardous atmosphere.

- Work on the potential equalization or the potential equalization connection is prohibited if there is a hazardous atmosphere.

Risks involved in opening the covers

Current-bearing components can be exposed when the covers or parts are removed, even if this can be done without tools. Current can be present at some connection points.

Risks involved in working with an open device

All work on a device that is open and connected to power should only be performed by trained personnel who are familiar with the risks involved.

The housing of the device must not be opened if the surrounding atmosphere is hazardous. The relevant caution statement on the housing should be noted.

When connected to power, the device housing may only be opened if it has been ascertained in accordance with the applicable regulations that the surrounding atmosphere cannot become potentially explosive.

… 1 Safety

… Safety instructions

Stopping the supply of sample gas
In the case of flammable and toxic sample gases, the supply of sample gas must be stopped and the sample gas feed path purged with nitrogen before the device housing is opened.

When safe operation can no longer be assured
If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:
- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

Comply with the safety regulations
The safety regulations for explosion protection must be complied with without fail before carrying out any work on the device.

Work prohibited when there is an explosion hazard
Carrying out work on live parts, with the exception of intrinsically safe circuits, and with auxiliary equipment which represents a danger of ignition is prohibited if there is an explosion hazard.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be).
Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.
ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Software downloads

By visiting the web page indicated below, you will find notifications about newly found software vulnerabilities and options to download the latest software. It is recommended that you visit this web page regularly:
www.abb.com/cybersecurity

Services and ports on the Ethernet interface

Port	Description
22/tcp	Used only for software updates. No direct access to the device.
502/tcp	Used for Modbus/TCP. The device allows connection to any Modbus client. The port needs to be activated using this configuration software: ECT 'EasyLine Configuration Tool'; the port is deactivated upon delivery.
8100/tcp	Used for test and calibration software Optima TCT Light. Binary proprietary protocol. The port is deactivated. It can be activated for TCT access via a secure connection, and deactivated when the TCT access is terminated

Access authorizations

Access to both the calibration functions and those functions used to change the instrument configuration can be restricted by means of password protection.
The password protection is not activated at the factory (except in the case of gas analyzers used for emission monitoring).

It is recommended that the factory-set passwords be changed by the operator, by means of the ECT software tool ("EasyLine Configuration Tool") **Password protection** on page 45. This limits access to both the ECT software tool itself and to the calibration and configuration functions of the device.

Manufacturer's address

ABB AG
Measurement & Analytics
Stierstädter Str. 5
60488 Frankfurt am Main
Germany
Tel: +49 69 7930-4666
Email: cga@de.abb.com

Service address

If the information in this Commissioning Instruction does not cover a particular situation, ABB Service will be pleased to supply additional information as required.
Please contact your local service representative.

Customer service center
Tel: 0180 5 222 580
Email: automation.service@de.abb.com

2 Use in potentially explosive atmospheres

Notes on use in potentially explosive atmospheres

Installation in accordance with IEC/EN 60079-14 (VDE 0165 Part 1)
The electric equipment must be installed in potentially explosive atmospheres in accordance with IEC/EN 60079-14 (VDE 0165 Part 1) “Electric Equipment for Hazardous Gas Areas, Part 14: Electric Systems in Potentially Explosive Atmospheres.”

Potential equalization
With regard to potential equalization, the provisions of IEC/EN 60079-14 as well as DIN VDE 0100 Part 410 “Protection against electric shocks” and Part 540 “Grounding, Protective ground, Potential equalization conductors” must be observed.

Electrostatic charges
Electrostatic charges must be avoided. The professional association rules for the “Prevention of ignition hazards due to electrostatic charges (BGR 132) must be observed here.
The gas analyzer may not be installed and operated in environments in which very high electrostatic charges may occur.
Such ambient conditions can usually be expected in dust explosion protection zones.

Monitoring and review
Electric systems in potentially explosive atmospheres must be monitored for proper condition.
As necessary, but at least every three years, they must be inspected by an electrician, provided they are not constantly monitored under the supervision of a responsible engineer.

Work on electric systems
Before any maintenance work is carried out on electric installations in potentially explosive atmospheres, the installations must be disconnected from the power supply.

The disconnect point must be identified with an appropriate warning sign, for example, "Do not power-up – explosion hazard" This does not apply to devices that may be opened as part of normal operation, such as registration devices, or for which it is expressly noted in the type examination certificate.

Maintenance work on the device where opening the housing or part of the housing is necessary is only permitted in a non-hazardous atmosphere.

⚠ DANGER

Risk of explosion!
There is an explosion hazard if the housing is opened in a potentially explosive atmosphere:
- Before opening the housing, make sure that no flammable or potentially explosive atmospheres are present.

Work on intrinsically safe circuits
Work on live systems may be carried out on intrinsically safe circuits even in potentially explosive atmospheres.
However, the electric data (inductance, capacity, current and voltage values) of the corresponding test equipment must be observed during power-up.
Special attention is required when carrying out work on intrinsically safe circuits that have been set up in connection with zone 0

Explosion hazard
Before repairs, the explosion hazard must have been eliminated.

Competent personnel
Repair work may only be performed by competent personnel.

Original spare parts
Only original spare parts may be used for repairs.

⚠ DANGER

Explosion hazard
Explosion hazard due to improper repair of the device.
- Repairs on flameproof joints are not permitted.

Inspection prior to recommissioning
If repair work is carried out on parts of electric equipment on which explosion protection depends, a specialist needs to inspect and certify before recommissioning that the attributes of the equipment in terms of design and version which are essential for explosion protection match the equipment described in the declaration.

Repairs by the manufacturer
Repairs can also be carried out by the manufacturer, for example on-site by an ABB Service employee or at the manufacturing plant.
In this case, a marking showing the performed repairs with subsequent routine testing is affixed to the name plate.
Testing by a specialist is not required then.

ATEX and IECEx Ex marking

Note
All documentation, declarations of conformity, and certificates are available in ABB's download area.
www.abb.com/analytical

Explosion protection

The gas analyzers are designed for use in potentially explosive atmospheres.
The gas analyzers are certified in accordance with European Directive 2014/34/EU ('ATEX Directive') as well as in accordance with the relevant IEC standards.

The housings of the gas analyzers are flameproof enclosures and fulfill the requirements of the explosion group IIC. As a result, the gas analyzers can also be used in hydrogen- or acetylene-containing atmospheres.

Standards and directives

The gas analyzer was designed and manufactured in accordance with the following standards:

- EN/IEC 60079-0
- EN/IEC 60079-1
- EN/IEC 60079-7

The gas analyzer must be designed, installed and operated in accordance with the following standards and directives:

- EN/IEC 60079-14
- EN/IEC 60079-17
- EN/IEC 60079-19

Note
The full designation of the applied standards, including the date of issue, is included in the declaration of conformity supplied with the device.

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	⟨Ex⟩ II 2G Ex db eb IIC T4 Gb

EL3060-Uras26 Analyzer unit	
EC type examination certificate	BVS 08 ATEX E 055 X
Marking	⟨Ex⟩ 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.

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

Note
Observe **Notes on use in potentially explosive atmospheres** on page 8.

Model numbers of the device components

Device component	Model number*
EL3060	24042-15x1x1xx0000
Chassis	24342-15x1x1xx0001
I/O electronic module	24442-15x1x1xx00y1**
Analyzer module Caldos25	24741-15x1x1xx00y1**
Analyzer module Caldos27	24742-15x1x1xx00y1**
Analyzer module Magnos28	24644-15x1x1xx00y1**
Analyzer module Uras26	24541-15x1x1xx00yy**

* The 'x' in the model number symbolizes any letter or number in the full designation.

** $y \neq 0$

… 2 Use in potentially explosive atmospheres

Special conditions

When operating the gas analyzer, the following conditions must be observed:

- The EL3060-Uras26 analyzer module may only be operated with control unit type EL3060-…, BVS 08 ATEX E 048 X.
- The parameters in accordance with 15.3.2 to 15.3.3 of the type examination certificate BVS 08 ATEX E 048 X must be observed.
- If flammable gases are supplied with a pressure of > 1.1 bar (> 1100 hPa), the gas path in the analyzer and the sample gas line must be purged with inert gas before commissioning.
- The analysis of mixtures of flammable gases with other gases with a pressure of > 1.1 bar (> 1100 hPa) is not permitted for explosive mixtures.
- 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-critical safety concentrations.
- The permissible ambient temperature range for the control unit is −20 to 50 °C.
  The permissible ambient temperature range for the EL3060-Uras26 analyzer module is −20 to 45 °C.
  The gas analyzer may only be switched on at an ambient temperature of > −10 °C.
- The dimensions of the flameproof open joints of this equipment deviate from the minimum and maximum values required in EN 60079-1:2014. Contact ABB for any information relating to dimensions.
- The inflow of the sample gas must be monitored with a flow rate limiter and must meet the requirements of EN 60079-1:2014, Appendix G3.3, see **Installing the flow restrictor** on page 27.
- The maximum permissible number and form of the threaded insertion points, as well as the installation location in the device are specified in the operating instructions.
- The measurement function for the explosion protection is not the subject of the EC type examination certificate.

3 Preparation for Installation

Scope of delivery

- Gas analyzer model EL3060 (control unit)
- Accessory bag containing:
  - Commissioning instruction
  - Device data sheet
  - 2 spacing bolts M5 × 100
  - For EL3060-Uras26 additionally:
    O-ring gasket Ø 220 × 3 mm

Note
The spacing bolts from the accessory bag are needed to mount the indicator and operating unit at a distance from the housing during service work on the open housing of the control unit.

NOTICE

Damage to the device
Damage to the device due to short circuits or mechanical damage when the spacing bolts are stored in the device housing or terminal compartment.
- Store the spacing bolts outside of the device housing or terminal compartment only.

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.

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.

Commissioning Instruction
The gas analyzer is delivered with a commissioning manual.

The commissioning instruction is an extract from the operating instruction, and it contains all the information required to install, commission and operate the gas analyzer safely, for its intended purpose.

The commissioning manual does not contain information regarding calibration, configuration and maintenance of the gas analyzer or about the Modbus® and PROFIBUS® interface.

Analyzer data sheet
The design of the gas analyzer that has been supplied is documented in detail in the analyzer data sheet.

… 3 Preparation for Installation

Material required for installation

Note
The materials listed below are not included in the scope of delivery of the device, and must be provided by the customer.

Gas connections
For the connection of piping:
- Threaded connections with ⅛ NPT thread and PTFE sealing tape.

Flowmeter/flow controller
Flowmeters or flow controllers with needle valve for setting and monitoring the sample gas flow as well as purge gas flow, if necessary.

Information for the selection and use of flowmeters:
- Measuring range 7 to 70 l/h
- Pressure drop < 4 hPa
- Needle valve open

Recommendation:
Flowmeter 7 to 70 l/h,
Order number 23151-5-8018474

Flow restrictor
The flow of sample gas into the gas analyzer must be limited with an external flow restrictor.
- The flow restrictor must meet the requirements of IEC / EN 60079-1:2014, Annex G, Section G.3.3.
- The specifications for the maximum permissible flow rate of the individual analyzers and device variants must be observed.

Shut-off valve
Install a shut-off valve in the sample gas line (recommended when the sample gas is pressurized).

Purging of the gas line system
Plan for the option of connecting an inert gas, such as nitrogen, from the gas sampling point for purging the gas line system.

Installation Material
EL3060-CU control unit
- Weight: approx. 20 kg
- Mounting material:
  4 screws M8 or M10, suited for 4 times the weight of the control unit, with appropriate washers.

EL3060-Uras26 Analyzer unit
- Weight: approx. 25 kg
- Mounting material:
  4 screws M8, suited for 4 times the weight of the analyzer unit, with appropriate washers.

Electric lines
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)

Conductor material
Select conductive material which is appropriate for the length of the lines and the predictable current load.

Separators
Provide separators in the power supply line and in the signal lines so that all poles of the gas analyzer can be separated from all voltage sources if necessary.

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!

Short gas paths
- Install the gas analyzer as close as possible to the sampling location.
- Install the gas conditioning and calibration modules as close as possible to the gas analyzer.

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

Protection from adverse ambient conditions
Protect the gas analyzer from the following influences:
- Cold,
- Exposure to heat from e.g. the sun, furnaces, boilers,
- Temperature variations,
- Strong air currents,
- Accumulation of dust and ingress of dust,
- Corrosive atmosphere,
- Vibration.

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

Housing protection (IP rating)
EL3060-CU control unit
IP 65

Uras26 Analyzer module
- 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)

… 3 Preparation for Installation

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.

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

The sample gas pressure in the gas analyzer's sample gas path may be max. 100 hPa gauge pressure (max. 1100 hPa absolute pressure).

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

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

Flow rate

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

Pressure drop at the flame barriers

Approx. 40 hPa at a flow rate of 50 l/h

Outlet pressure

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

… 3 Preparation for Installation

Sample gas inlet conditions with positive pressure 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' option is not available.

Sample gas composition

A special version of the gas analyzer is suitable for measuring non-flammable and flammable gases under positive pressure. Under no circumstances may the sample gas be potentially explosive.

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 Magnos28, Caldos25, Caldos27 analyzers

Temperature

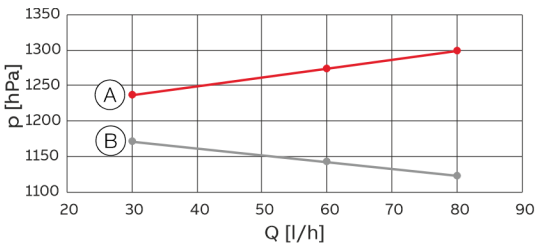
5 to 50 °C

Pressure in the sample gas path

Measured gas	Permissible inlet pressure
Occasionally explosive mixture (Zone 1 equivalent)	Absolute pressure maximum 1.1 bar (1100 hpa) Gauge pressure to the atmosphere max. 100 hPa
Non-explosive mixture	Absolute pressure maximum 1.2 bar (1200 hpa) Gauge pressure to the atmosphere max. 200 hPa

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

- Maintaining max. 100 hPa gauge pressure (max. 1100 hPa absolute pressure) / max. 200 hPa gauge pressure (max. 1200 hPa absolute pressure) at the sample gas inlet.
- Maintaining the pressure limits for the sample gas inlet and -outlet in accordance with **Figure 1**.



Ⓐ Maximum inlet pressure Ⓑ Maximum outlet pressure

p Pressure Q Flow rate

Figure 1: Max. pressure hPa abs. for internal pressure 1200 hPa abs.

Flow rate

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).

Pressure drop at the flame barriers

Approx. 155 hPa at a flow rate of 50 l/h

Sample gas inlet and outlet conditions for Uras26 analyzer

Temperature

5 to 45 °C (41 to 113 °F)

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) Gauge pressure to the atmosphere max. 100 hPa
Non-explosive mixture	Absolute pressure maximum 1.4 bar (1400 hpa) Gauge pressure to the atmosphere max. 400 hPa

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

- Maintaining max. 100 hPa gauge pressure (max. 1100 hPa absolute pressure) / max. 400 hPa gauge pressure (max. 1400 hPa absolute pressure) at the sample gas inlet.

Flow rate

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).

Pressure drop at the flame barriers

Approx. 40 hPa at a flow rate of 50 l/h

… 3 Preparation for Installation

Samples Gases for the Calibration

Test gases – Uras26

Analyzer(s)	Test gas for the zero calibration	Test gas for the end-point calibration
Uras26 with calibration cells (automatic calibration)	N_2 or air or sample component-free gas	— (calibration cells)
Uras26 without calibration cells (automatic calibration)	N_2 or air	Span gas*
Uras26 without calibration cells (manual calibration)	N_2 or air	Test gas for each sample component
Uras26 + Magnos28 (automatic calibration, i.e. Magnos28 with single-point calibration)	IR sample component-free test gas with O_2 concentration in an existing measuring range or ambient air.	Calibration cells or span gas*
Uras26 Magnos28 (manual calibration)	Zero point gas for Uras26 or Magnos28, or for single-point calibration for Magnos28, IR sample component-free test gas with O_2 concentration in an existing measuring range or ambient air	Span gas for all sample components in the Uras26 and Magnos28 (possibly only for the Uras26 if a single-point calibration is carried out for the Magnos28)
Uras26 + Caldos27 (automatic calibration, i.e. Caldos27 with single-point calibration)	IR sample component-free test gas with a known and constant rTC value (possibly also dried room air)	Calibration cells or span gas*
Uras26 + Caldos27 (manual calibration)	Zero reference gas for Uras26 or Caldos27, or IR sample component-free test gas with a known rTC value	Span gas for all sample components in the Uras26 and Caldos27 (possibly only for the Uras26 if a single-point calibration is carried out for the Caldos27)
Uras26 + Caldos25 (automatic calibration)	Sample component-free test gas or substitute gas for Uras26 and Caldos25	Test gas or substitute gas mixture for all sample components in the Uras26 and in the Caldos25*
Uras26 + Caldos25 (manual calibration)	IR sample component-free test gas for Uras26 and sample component-free test gas or substitute gas for Caldos25	Span gas for all sample components in the Uras26 and test gas or substitute gas with known sample component concentration for Caldos25

* Test gas mixture for multiple sample components possible if no or negligible cross-sensitivity is present

Dew point
The dew point of the test gases must be approximately equal to the dew point of the sample gas.

Note
The instructions for calibration must be observed, see **Calibration** in the operating instruction.

Test gases – Magnos28

Analyzer	Test gas for zero point calibration and single-point calibration	Test gas for the end-point calibration
Magnos28	Oxygen-free process gas	Process gas with a known O_2 concentration
Magnos28 with single-point calibration	Test gas with O_2 concentration in an existing measuring range or ambient air.	—
Magnos28 with substitute gas calibration	Oxygen-free process gas or substitute gas (O_2 in N_2)	Substitute gas, for example dried air

Dew point
The dew point of the test gases must be approximately equal to the dew point of the sample gas.

Note
The instructions for calibration must be observed, see **Calibration** in the operating instruction.

Test gases – Caldos27

Analyzer	Test gas for zero point calibration and single-point calibration	Test gas for the end-point calibration
Caldos27	Sample component-free test gas or process gas	Test gas or process gas with a known sample component concentration
Caldos27 with a suppressed measuring range	Test gas with a sample component concentration near the starting point of the measuring range	Test gas with a sample component concentration near the end point of the measuring range
Caldos27 with single-point calibration	Test gas with a known and constant rTC value (standard gas; possibly also dried room air)	—

Dew point
The dew point of the test gases must be approximately equal to the dew point of the sample gas.

Note
The instructions for calibration must be observed, see **Calibration** in the operating instruction.

Test gases – Caldos25

Analyzer	Test gas for the zero calibration	Test gas for the end-point calibration
Caldos25	Sample component-free test gas or process gas	Test gas or process gas with a known sample component concentration near the end point of the measuring range
Caldos25 with substitute gas calibration	Sample component-free substitute gas	Substitute gas with a known sample component concentration near the end point of the measuring range

Dew point
The dew point of the test gases must be approximately equal to the dew point of the sample gas.

Note
The instructions for calibration must be observed, see **Calibration** in the operating instruction.

… 3 Preparation for Installation

Pressure sensor

Which gas analyzers have a pressure sensor installed?

Gas analyzer	Pressure sensor
Uras26, Caldos27	Factory-installed as standard
Magnos28	Factory-installed as an option
Caldos25	Not installed

Information for the safe and correct operation of the pressure sensor

⚠ DANGER

Explosion hazard

Explosion hazard when measuring flammable or ignitable gases with the pressure sensor.

- The pressure sensor must not be connected to the sample gas path if the sample gas contains flammable or ignitable components.

NOTICE

Damage to the pressure sensor

Damage to the pressure sensor by corrosive gases.

- For the measurement of corrosive gases, the terminal of the pressure sensor must not be connected to the sample gas path.

- The pressure sensor measures the air pressure inside the housing as standard.
  It is optionally connected to a connection port with an FPM tube (flame barrier).
- If the pressure sensor is connected to the outside by hose, the yellow plastic screw cap must be screwed out of the connection ports of the pressure sensor (flame barrier) before the gas analyzer is commissioned.
- For a precise pressure correction (see **Pressure correction** on page 41) the connection of the pressure sensor and sample gas outlet should be connected with each other via a T-piece and short lines.
  The lines must be as short as possible or – in the case of a greater length – have a sufficiently large inside diameter (min. 10 mm) so that the flow effect is minimized.
- If the pressure sensor connection is not connected to the sample gas outlet, an exact pressure correction is required so that the pressure sensor and the sample gas outlet have the same pressure.
- Pressure sensor working range:
  p_{abs} = 600 to 1250 hPa.

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

⚠ DANGER

Risk of suffocation

Risk of suffocation due to leaking purge gas. Purge gas can escape from the housing if there are any leak points.

- When using nitrogen as the purge gas, take all required precautions against suffocation.

Suited purge gases

- Nitrogen or clean instrument air from non-explosive areas.
  (Instrument air quality, based on ISO 8573-1 Class 3, i.e. particle size max. 40 µm, oil content max. 1 mg/m^3, dew point max. +3° C).

Note

The purge gas for purging the EL3060-Uras26 analyzer unit must not contain any sample gas components.
Any sample components in the purge gas can cause false readings.

Operating conditions of the housing purging

To maintain the atmospheric conditions in the flameproof housing, comply with the following conditions:

- The gauge pressure in the purging gas path may be max. 80 hPa (max. 1080 hPa absolute pressure).
  or
- The purge gas is feed to the inlet in depressurized state and sucked off at the output ($p_e \geq -100$ hPa).

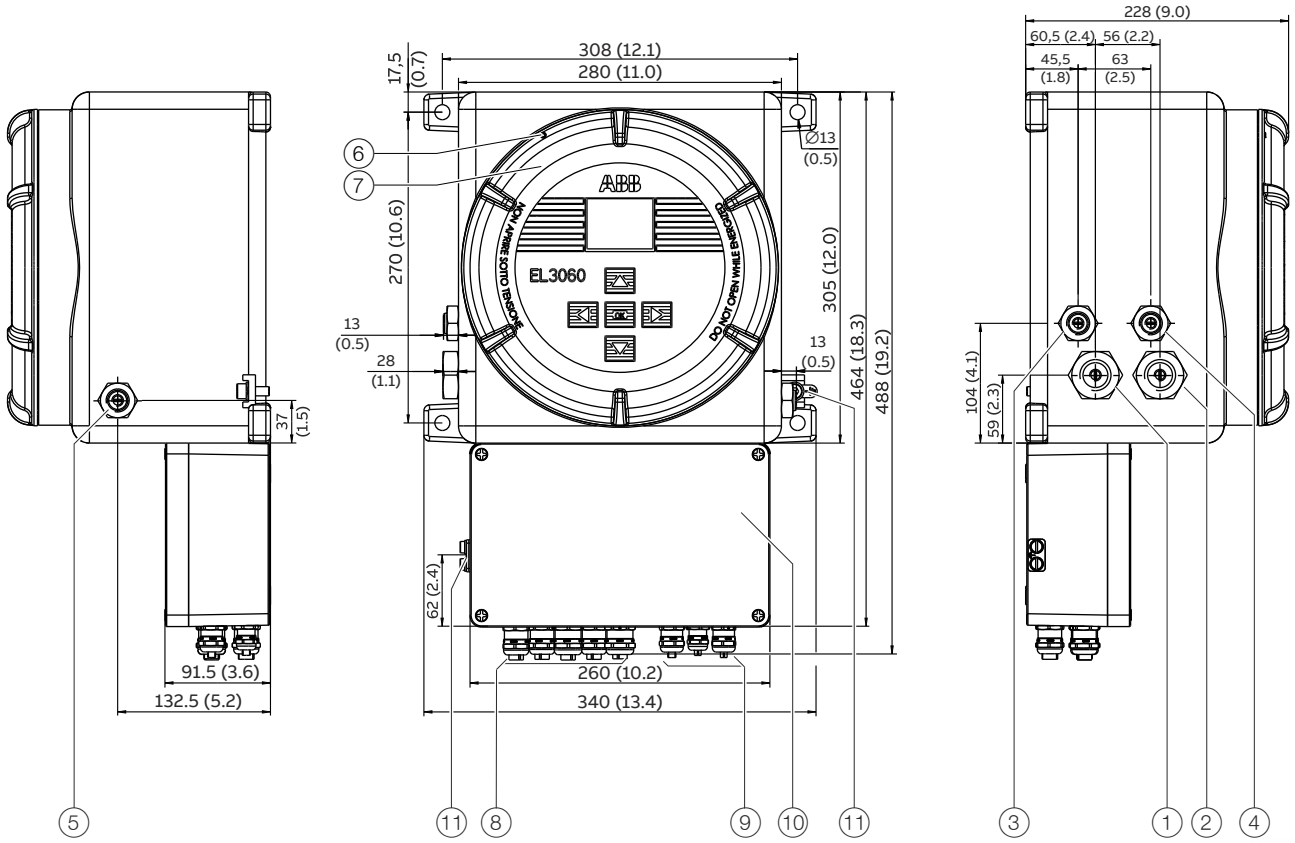
The purging gas flow during operation must be limited to 10 l/h. The pressure drop at the flame barriers is approx. 20 hPa for a flow rate of 10 l/h.

The flameproof housings are specially gasketed so that the loss of purging gas when purging the housing remains low.
With the EL3060-Uras26 analyzer unit, the purging gas loss can be further reduced by inserting the supplied O-ring (Ø 220 x 3 mm) between the housing base and the housing in the groove provided.

Dimensions

EL3060-CU control unit

Dimensions in mm (in)



Standard Version

1. Sample gas inlet*
2. Sample gas outlet*
3. Purging gas inlet**
4. Purging gas outlet**
5. Connection of the pressure sensor***

Design for measuring gases under gauge pressure:

1. Vent*
2. Sample gas outlet*
3. Purging gas inlet**
4. Sample gas inlet*
5. Connection of the pressure sensor***, **** or 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 29)
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 20) must not be connected to the sample gas path when measuring flammable or corrosive gases.
**** not in the design with housing purge

Figure 2: Dimensions of the EL3060-CU control unit

Design of the gas connections

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

Note

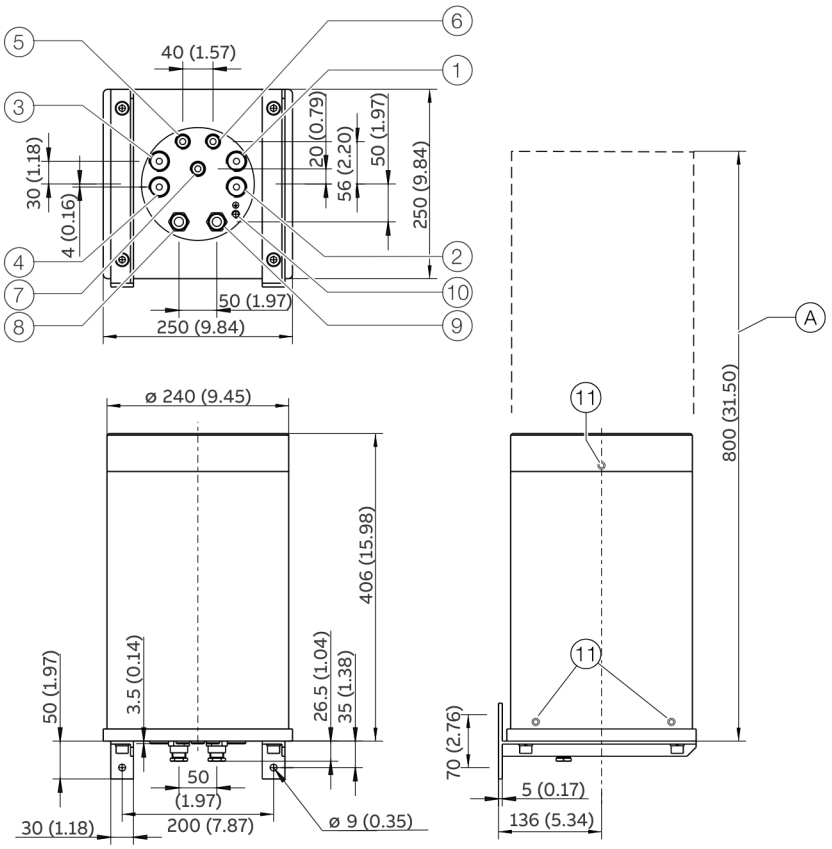
Bear in mind the extra space required for the connection leads under and immediately to the left and right of the control unit (approx. 10 cm in each case).

… 3 Preparation for Installation

… Dimensions

EL3060-Uras26 Analyzer unit

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 20) must not be connected to the sample gas path when measuring flammable or corrosive gases.

Figure 3: EL3060-Uras26

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).

4 Installation

Unpacking the Gas Analyzer

⚠ CAUTION

Injury hazard due to heavy weight

The EL3060-CU control unit weighs approximately 22 kg.
The EL3060-Uras26 analyzer unit weighs approx. 25 kg.

- Two people are required for unpacking, transport, and assembly!

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents.
All claims for damages must be submitted to the shipper without delay and before installation.

1. Remove the accessories (refer to **Scope of delivery** on page 11) from the transport carton.
   Take care not to lose any of the accessories.
2. Remove the gas analyzer from the carton, together with the padding material.
3. Remove the padding material and place the gas analyzer in a clean area.
4. Clean the adhesive packaging residue from the gas analyzer.

Note

Keep the shipping carton and cushioning material for future transportation.

Name plate

Contents of the name plate

The name plate contains the following information:

- Production Number (P-No.),
- Order Number (O-No.),
- Power supply (voltage, frequency, max. power consumption),
- Installed analyzers with measurement components and measuring ranges.

Analyzer data sheet

Contents

The analyzer data sheet contains the following information:

- Order Number (O-No.),
- Job number (J-No.)
- Production Number (P-No.),
- Production Date,
- Power supply
  (voltage, frequency, max. power consumption),
- Measuring components and measuring ranges,
- Serial numbers of the installed modules.

The device data sheet is located in the accessory bag when the device is delivered.

Note

- Keep the device data sheet in the gas analyzer so that the device data sheet is always at hand, especially in case of service/maintenance, see **Service address** on page 7.
- During commissioning, observe the information in the analyzer data sheet. The information given in the analyzer data sheet may differ from the general information in this regard Commissioning Instruction.

… 4 Installation

Mounting the fittings on the gas analyzer

To connect the gas lines to the gas analyzer, screw-in sockets (fittings) are used in different designs.

Depending on the design, the fittings are included in the scope of delivery or must be provided during the assembly.

Position and design of the gas connections

The position and arrangement of the gas connections is shown in the dimension drawings of the control and analyzer unit, see **Dimensions** on page 21.

General information

Note

It is recommended that the fittings be installed on the analyzer module before the gas analyzer is mounted, as the connection ports are still easily accessible before the analyzer is mounted.

Fittings

- Die verwendeten Fittings müssen sauber, fettfrei und frei von Rückständen sein!
  - Verunreinigungen aus den Fittings können in den Analysator gelangen und den Analysator beschädigen und das Messergebnis verfälschen.
- Die Installationshinweise der Fitting-Hersteller beachten!
- Die Einschraubverschraubungen beim Anschließen der Gasleitungen gegenhalten!

Fittings

- The fittings used must be clean and free of grease and residue!
  - Impurities from the fittings can enter the analyzer and damage it. They could also falsify the measurement result.
- Observe the installation instructions provided by the manufacturers of the fittings!
- Hold back the screw connections when connecting the gas lines!

Gaskets

- Do not use sealing compound to seal the fittings!
  - Components of the sealing compound could falsify the measurement results.
- The sealing material must be free of grease.

Requisite Material

Threaded connections (fittings) with ⅛ NPT thread and PTFE sealing tape.

Installing the fittings

1. Screw out the yellow plastic screwing caps (5 mm hexagon socket) from the connection ports.
2. Wrap PTFE sealing tape tightly around the thread of the screw-in fitting twice, clockwise, and screw it into the connection socket.
   After mounting, approx. 2 threads usually remain visible

Note

Screw the fittings in carefully, and not too tightly!

Checking gas path leak tightness

The leak tightness of the sample gas path and the reference gas path, if applicable, is factory-tested with a helium leak test for a leak rate of $< 2 \times 10^{-4}$ hPa l/s.

However, since the leak tightness may be impaired when transporting the gas analyzer (for example due to severe vibrations), we recommend that you check it prior to commissioning at the installation site.
Refer to **Checking gas path leak tightness** on page 41.

Note

We strongly recommend checking the tightness of the gas feed paths before the gas analyzer is assembled, since the housing must be opened in the event of a leak.

Gas Analyzer Installation

⚠ CAUTION

Injury hazard due to heavy weight
The EL3060-CU control unit weighs approximately 22 kg.
The EL3060-Uras26 analyzer unit weighs approx. 25 kg.
- Two people are required for unpacking, transport, and assembly!

Installation of the EL3060-CU control unit
The material for installation (see **Installation Material** on page 12) should be provided on-site.
The installation site must fulfill the requirements in accordance with **Requirements for the installation site** on page 13.

The control unit must be installed in such a way that the terminal housing faces downwards, see **EL3060-CU control unit** on page 21.

Installation of the EL3060-Uras26 analyzer unit
The material for installation (see **Installation Material** on page 12) should be provided on-site.
The installation site must fulfill the requirements in accordance **Requirements for the installation site** on page 13.

The analyzer unit can be installed with the housing either in a vertical or horizontal orientation.

Vertical orientation
- The gas connections must be directed downwards, see **EL3060-Uras26 Analyzer unit** on page 22 – bottom left.
- To guarantee housing protection IP 65, the supplied O-ring gasket (ø 220 × 3 mm) must be inserted between the housing base and the housing in the groove provided.
- Without the inserted O-ring gasket, only housing protection IP 54 is guaranteed.

Horizontal orientation
- The openings for the connection cables must be at the bottom, **EL3060-Uras26 Analyzer unit** on page 22 – top left.
- To guarantee housing protection IP 65, the supplied O-ring gasket (ø 220 × 3 mm) must be inserted between the housing base and the housing in the groove provided.

Note
When the O-ring gasket is inserted, the housing can be opened and closed with a suited tool only.

Connecting the gas lines

NOTICE

Potential adverse effect on the IP rating
Yellow sealing plugs (transport protection) are applied to the gas connections on the analyzer and housing to secure them during transport. The yellow sealing plugs do not guarantee a sufficient IP rating.
- Remove the yellow sealing plugs before commissioning.
- Close unused gas connections with suited sealing plugs to guarantee the IP rating.

NOTICE

Damage to the gas analyzer
Damage to the gas analyzer due to condensing sample gas during commissioning.
- Observe the condition of the sample gas inlet of the analyzer modules.
- Purge the sample gas path before commissioning, see **Pre-purge gas paths** on page 40.
- Do not connect the sample gas until the gas analyzer has reached room temperature and after the warm-up phase has elapsed, see **Duration of the Warm-up Phase** on page 40.

Position and design of the gas connections
The position and arrangement of the gas connections is shown in the dimension drawings of the control and analyzer unit, see **Dimensions** on page 21.

Design of the gas connections
All gas connections are made through internal flame barriers made of rust-resistant and acid-resistant steel 1.4571 with ⅛ NPT female thread
- Sample gas inlets and outlets
- Flowing reference gas for EL3060-Uras26 (optional)
- Housing purging (optional)
- Pressure sensor (optional)

The assignment of the gas connections in a delivered EL3060-Uras26 analyzer unit is documented in the device data sheet.

… 4 Installation

… Connecting the gas lines

Safety measures for operation with gauge pressure in the sample gas path

For operating using positive pressure in the sample gas feed path, a special version of the gas analyzer is required.

This version is labeled with a notice on the name plate: 'Sample gas pressure, see Special Conditions'.

When operating using gauge pressure in the sample gas feed path, the following safety measures must be observed:

- Additional vents are installed (designed as sample gas flame barriers) to protect the flameproof housing:
  - One vent in the control unit housing if one of the Magnos28, Caldos25, or Caldos27 analyzers is installed in the control unit,
  - Two vents in the Uras26 analyzer unit housing.

  The openings of the inner and outer vents must always remain open.
- If there is gauge pressure on the sample gas -outlet and inlet side, in the case of disrupted operation, sample gas flow can come from both sides (for instance if the sample gas line in the analyzer ruptures).
  In this case, you need to guarantee that the total of the sample gas flows from both sides cannot exceed the maximum value of 80 l/h (Caldos25, Caldos27, Magnos28) or 100 l/h (Uras26).

Connecting gas lines

NOTICE

Damage to components

Damage to components and impairment of explosion protection by up-scaling the permissible tightening torque of the screwed connections (flame barriers).

- Do not up-scale the maximum permitted tightening torque of 50 Nm.
- Use a suited torque wrench to tighten the screwed connections.

Professionally connect stainless steel pipes to the screwed connections (flame barriers), taking into account the leak tightness requirements.

Connect pressure sensor

DANGER

Explosion hazard

Explosion hazard when measuring flammable or ignitable gases with the pressure sensor.

- The pressure sensor must not be connected to the sample gas path if the sample gas contains flammable or ignitable components.

NOTICE

Damage to the pressure sensor

Damage to the pressure sensor by corrosive gases.

- For the measurement of corrosive gases, the terminal of the pressure sensor must not be connected to the sample gas path.

- The pressure sensor measures the air pressure inside the housing as standard.
  It is optionally connected to a connection port with an FPM tube (flame barrier).
- If the pressure sensor is connected to the outside by hose, the yellow plastic screw cap must be screwed out of the connection ports of the pressure sensor (flame barrier) before the gas analyzer is commissioned.
- For a precise pressure correction (see **Pressure correction** on page 41) the connection of the pressure sensor and sample gas outlet should be connected with each other via a T-piece and short lines.
  The lines must be as short as possible or – in the case of a greater length – have a sufficiently large inside diameter (min. 10 mm) so that the flow effect is minimized.
- If the pressure sensor connection is not connected to the sample gas outlet, an exact pressure correction is required so that the pressure sensor and the sample gas outlet have the same pressure.
- Pressure sensor working range:
  p_{abs} = 600 to 1250 hPa.

Installing the flowmeter
Install a flowmeter or flow monitor with needle valve before the sample gas inlet and if necessary before the purge gas inlet to be able to adjust and monitor the gas flow.

Installing the flow restrictor
- The flow of sample gas into the gas analyzer must be limited with an external flow restrictor.
- The flow restrictor must meet the requirements of EN 60079-1:2014, Annex G, Section G.3.3.
- The specifications for the maximum permissible flow rate of the individual analyzers and device variants must be observed

Provide for sample gas line purging
Install a shut-off valve in the sample gas line (highly recommended for pressurized sample gas) and provide the option of introducing an inert gas, such as nitrogen, from the gas sampling point, for purging of the sample gas line.

Exhaust gas lines
The exhaust gases of the gas analyzers are dissipated via the sample gas outlets. The exhaust gases can be discharged into the atmosphere via a common exhaust gas line.

Note
Dispose of corrosive, toxic or combustion exhaust gases according to the regulations!

Observe the following points when connecting the exhaust gas lines:
- Guide the exhaust gases from the gas analyzer directly into the atmosphere or in depressurized state through the shortest possible line with a large inside diameter, or into an exhaust pipe.
- Do not install any throttle sections or shut-off valves in the exhaust gas line!

5 Electrical connections

Safety instructions

⚠ DANGER

Risk of explosion!
There is an explosion hazard if the housing is opened in a potentially explosive atmosphere:
- Before opening the housing, make sure that no flammable or potentially explosive atmospheres are present.

⚠ WARNING

Risk of injury due to live parts.
Improper work on the electrical connections can result in electric shock.
- Connect the device only with the power supply switched off.
- Observe the applicable standards and regulations for the electrical connection.

General Notes

Potential equalization
- The external potential equalization connections of the control unit and the analyzer unit must be connected to the local potential equalization.
- The local potential equalization must be connected before any other connections are made.
- The connectors have a clamping range of max. 4 mm^2.

Danger of interrupted potential equalization
The device can be hazardous if the protective lead is interrupted inside or outside the device or if the protective lead is disconnected.

⚠ DANGER

Explosion hazard
Explosion hazard when working on the potential equalization or the potential equalization connection in an existing hazardous atmosphere.
- Work on the potential equalization or the potential equalization connection is prohibited if there is a hazardous atmosphere.

Securely install electric lines
The electric lines including the connections between the analyzer unit and the control unit must be securely installed.

Connection cable of the EL3060-Uras26 analyzer unit
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).

Shielded cables
Shielded cables must be guided through EMC cable glands. The braided shield must be attached to the EMC cable glands.
Refer to **Mount EMC cable glands** on page 36.

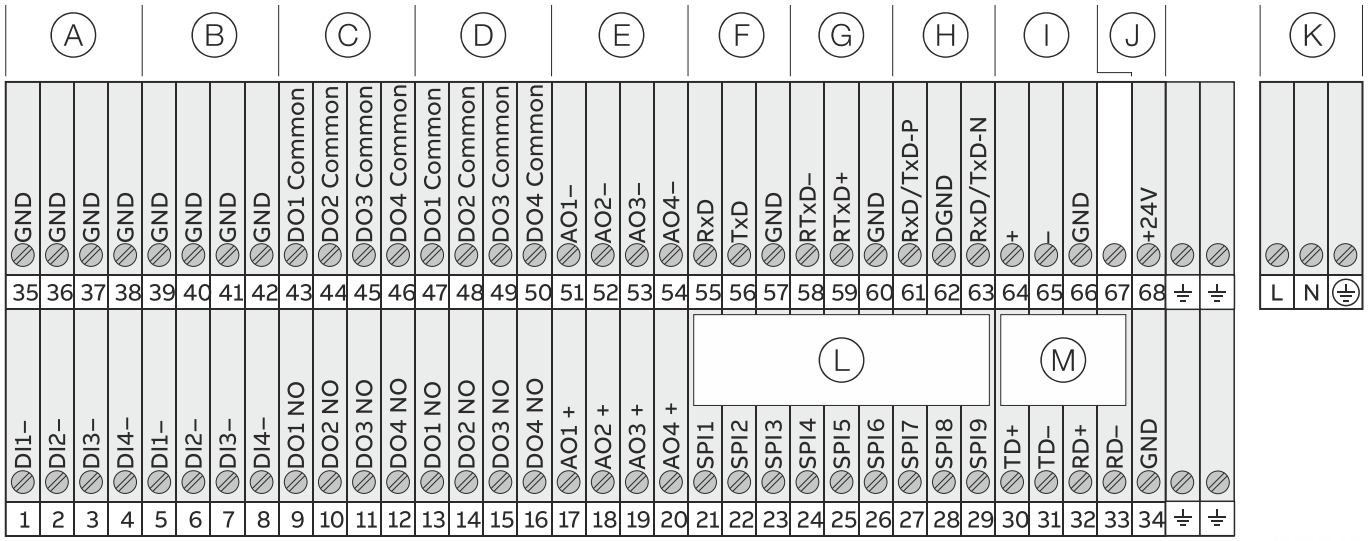
Separated installation
The signal lines must be installed separately from the power supply lines.

Install analog and digital signal lines separately from each other.

Unused cable glands
Unused cable glands must be sealed off with sealing plugs.
Cap nuts must be screwed tightly onto the unused cable glands.

Before connecting the power supply
Before connecting the power supply, make sure that the line voltage is in the 100 to 240 V AC range permitted for operation of the gas analyzer.

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 4: 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.

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).

… 5 Electrical connections

… Terminal assignment

Standard assignment of digital inputs and digital outputs

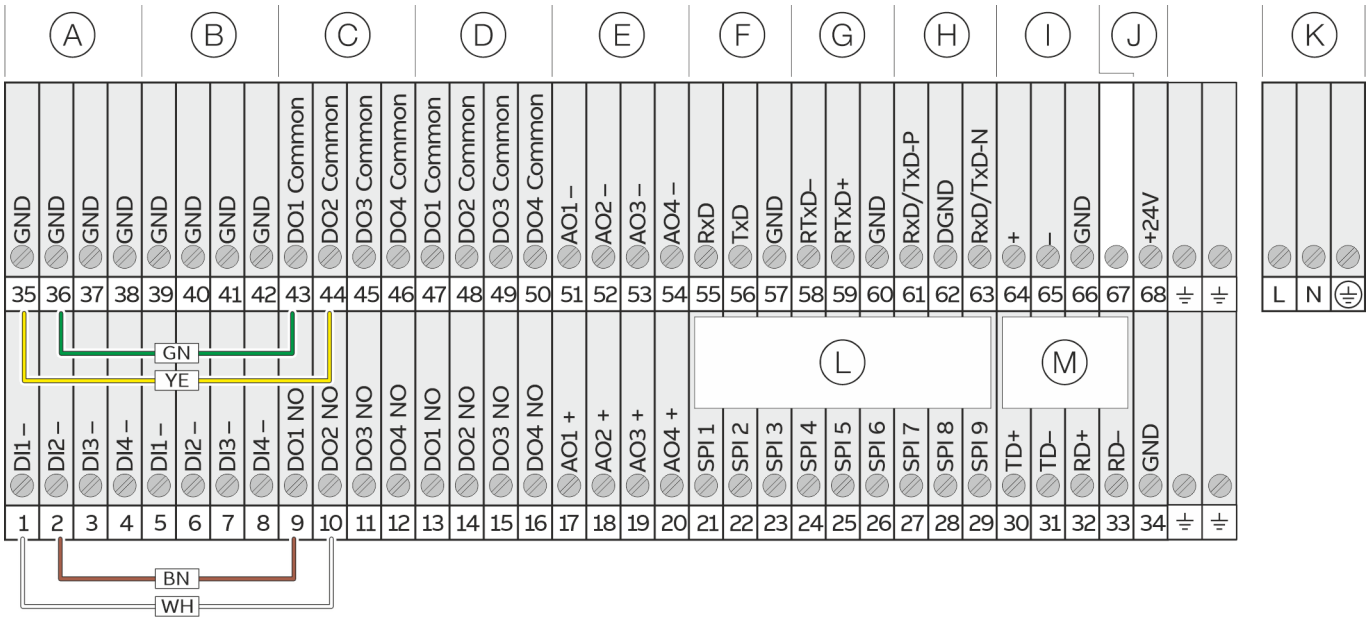
Function	Standard assignment* Digital I/O Module 1	Standard assignment* Digital I/O Module 2
Failure		
Maintenance required		
Maintenance mode		
Overall status	**DO1**	
Start automatic calibration	**DI1**	
Stop automatic calibration		
Disable automatic calibration	**DI2**	
Sample gas valve	**DO4**	
Zero 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 Operating instruction).

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

Assignment of the digital inputs and digital outputs – 'Nitrogen Header' application

In the 'Nitrogen Header' application, the digital outputs DO1 and DO2 as well as digital inputs DI1 and DI2 for the automatic sample component and measuring range switching are connected to one another by wire bridges at the factory. These wire bridges may not be changed or removed.



- (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 5: 'Nitrogen Header' application terminal assignment

The Caldos27 analyzer is calibrated at the factory in such a way that the current signals of the sample components are output at the analog output as follows:

- Stream 1: C_nH_m 15 to 0 vol. % = 4 to 12 mA
- Stream 2: H_2 0 to 1 vol. % = 12 to 20 mA.

For calibration performed by the customer, a substitute gas component for the joint calibration of both streams has been configured: H_2 in N_2 0 to 2 vol. %.

… 5 Electrical connections

… Terminal assignment

Conversion of the digital outputs to changeover contacts

In the EL3060, the digital outputs are internally available as changeover contacts; However, due to lack of space, only the common and the NO contacts are brought out of the central unit to the terminal blocks.

Through the conversion, it is possible to also bring out the NC contacts to the terminal blocks and thus use the digital outputs as changeover contacts.

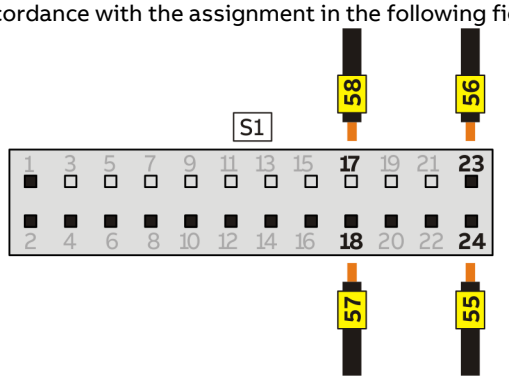
Note

The prerequisite for the conversion is that the Modbus® RS232 and RS485 or PROFIBUS® RS485 interfaces are not used.

Conversion for 1 digital I/O module

The existing lines of the Modbus® interfaces in the housing of the EL3060 control unit are used to route the NC contacts of the digital outputs to the terminal blocks.

1. Unsolder all lines from the contacts in the D-SUB connectors S5 and S6.
2. Shorten wires 55 and 58 in the previous soldering area and tin-plate the wire ends.
3. Remove the socket connector S1 of the digital I/O module 1 and insert the wires 55 to 58 into the specified free positions in accordance with the assignment in the following figure:

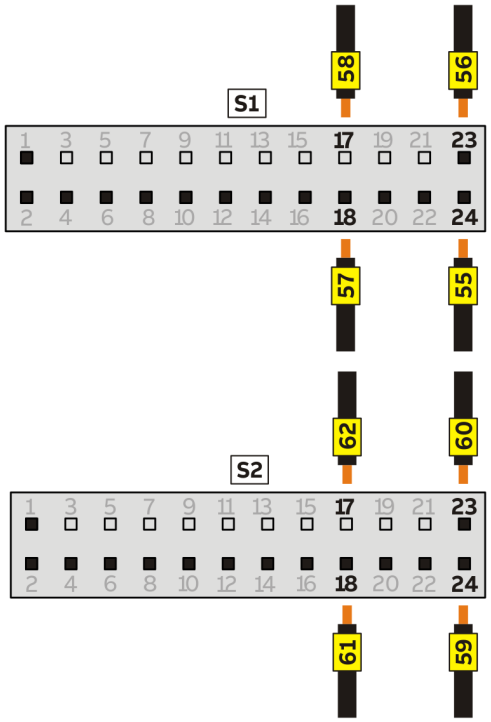


4. Insulate the ends of the unused wires 59 and 60 in the appropriate manner.

Conversion for 2 digital I/O modules

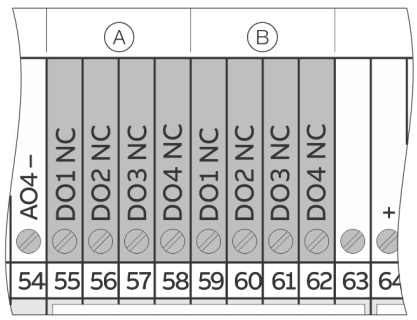
The existing lines of the Modbus® and PROFIBUS® interfaces in the housing of the EL3060 control unit are used to route the NC contacts of the digital outputs to the terminal blocks.

1. Unsolder all lines from the contacts in the D-SUB connectors S5, S6 and S7.
2. Shorten wires 55 and 62 in the previous soldering area and tin-plate the wire ends.
3. Remove the socket connectors S1 and S2 of the digital I/O modules 1 or 2 and insert wires 55 to 62 in the specified free positions in accordance with the assignment in the following figure:



4. Insulate the end of unused wire 63 in the appropriate manner.

Terminal assignment of the terminal blocks after the conversion



Ⓐ Digital outputs DI/DO-Module 1 Ⓑ Digital outputs DI/DO-Module 2

Figure 6: New assignment of terminals 55 to 63

Analog outputs

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

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 device data sheet and on the name plate, see **Analyzer data sheet** on page 11..

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

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.

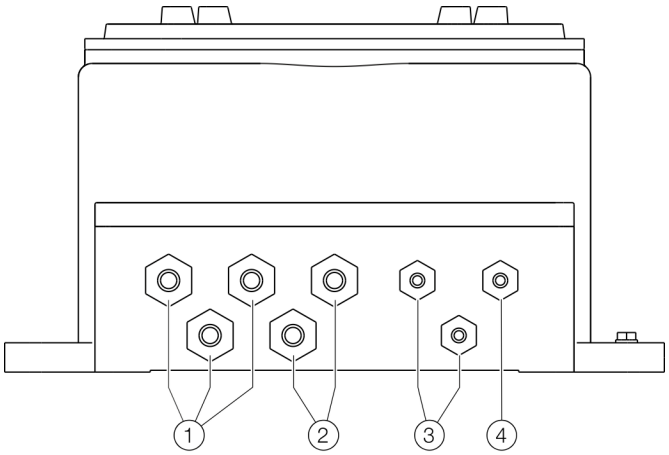
Note
The Modbus® or PROFIBUS® protocol is an unsecured protocol (in the context of IT or cyber security), therefore the intended application should be assessed before implementation to make sure that the protocol is suited.

PROFIBUS® bus termination

The gas analyzer can be integrated into a PROFIBUS® network in two ways:

- As a device without a bus termination
- As a bus connection device

Connection as a device without bus termination



① M20×1.5
② M20×1.5 EMC
③ M16×1.5 EMV
④ M16×1.5

Figure 7: Assignment of the cable glands

Required accessory
If one of the two standard built-in M16×1.5-EMC cable glands ③ is already used, for example by an Ethernet cable, the existing M16×1.5 cable gland ④ must be replaced by an additional M16×1.5-EMC cable gland (for approved type, see Table Fehler! Verweisquelle konnte nicht gefunden werden.).

Approved EMC cable gland
M16 metal cable gland type HSK-M-EMV-Ex, 1.616.1600.51, from Hummel AG

… 5 Electrical connections

… Terminal assignment

Installation

1. If necessary, replace the M16 cable gland ④ with an M16 EMC cable gland.
   Note
   If the second M16 EMC cable gland is already used, the power supply cable from the M16 cable gland ④ needs to be relocated to a free M20 cable gland ①.
2. Insert the cable of the PROFIBUS® connection lead into the terminal box through an M16 EMC cable gland ③ and place the braided shield onto the cable gland, **Mount EMC cable glands** on page 36.
3. Insert the cable of the secondary PROFIBUS lead into the terminal box through an M16 EMC cable gland ③ and place the braided shield onto the cable gland.
4. Join each of the wires of the two RxD/TxD-P and RxD/TxD-N leads in a double wire-end sleeve and connect to terminals 61 and 63, see **Terminal assignment** on page 29.

Connection as a bus connection device

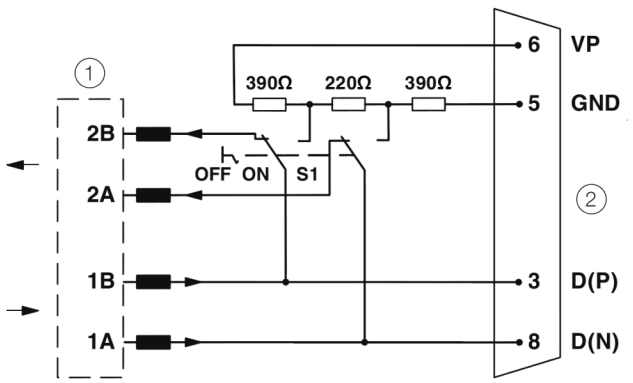
Required accessory

For operation as a bus connection device, an approved bus terminating connector must be installed.

Approved bus terminating connector
D-SUB bus connector with terminating resistor type SUBCON-PLUS-PROFIB/AX, 2744377, from Phoenix Contact.

Installation

1. Insert the cable of the PROFIBUS® cable into the terminal box through an M16 EMC cable gland (**Fehler! Verweisquelle konnte nicht gefunden werden.**, Pos. ③) and place the braided shield onto the cable gland, see **Mount EMC cable glands** on page 36.
2. Connect the wires to terminals 61 and 63, see **Terminal assignment** on page 29.
3. Remove the screws from the electronics module support and remove the electronics module support from the housing.
4. Pull out the D-sub connector S7 from the PROFIBUS module.
5. Insert the electronics module support into the housing and secure in place using the screws.
6. Unsolder all leads of the D-sub connector S7 from the contacts.
7. Shorten wires 61 and 63 in the previous soldering area and fit cable-end sleeves to the wires.
8. Connect wire 61 (RxD/TxD-P) to terminal 1B and connect wire 63 (RxD/TxD-N) to terminal 1A of the D-SUB bus connector with terminating resistor.



① Terminals ② D-SUB connector

Figure 8: Connection to the D-SUB bus terminating connector

9. Insulate the end of unused wire 62 in the appropriate manner.
10. Attach the D-sub bus connector with terminating resistor to the PROFIBUS module and secure in place.
11. Activate the terminating resistor using the slide switch.

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.

Note

The Ethernet protocol is an unsecured protocol (in the sense of IT or cyber security), as such the intended application should be assessed before implementation to make sure that this protocol is suited.

EL3060-Uras26 Analyzer unit

Terminals	Wire assignment
Data transfer: Terminals 21 to 29:	Wires 1 to 9 (printed on the wires)
Assignment:	Terminal 21 – Wire 1 to Terminal 29 – Wire 9
Power supply: Terminals 34 (GND) and 68	(+24V, wire with red marking), separate PE connection

Power supply

Terminals: L, N, PE

Design of the electrical connections

Terminal blocks with screw connection

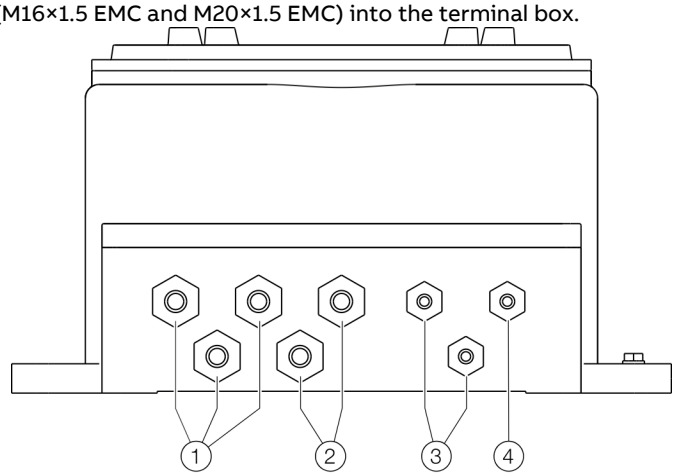
Conductor cross-section:

- 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)

Cable glands

Assignment of the cable glands

The shielded connection cables for Modbus®, PROFIBUS®, and Ethernet as well as for data transmission and the power supply of the EL3060-Uras26 analyzer unit must be connected through EMC cable glands with terminal insert for the braided shield (M16×1.5 EMC and M20×1.5 EMC) into the terminal box.



1 M20×1.5
2 M20×1.5 EMC
3 M16×1.5 EMV
4 M16×1.5

Figure 9: Assignment of cable glands EL3060-CU control unit

Pos.	Cable gland	Connecting cables
1	M20×1.5	Digital inputs/outputs
1	M20×1.5	Analog outputs
2	M20×1.5 EMC	EL3060-Uras26 data transmission
2	M20×1.5 EMC	EL3060-Uras26 power supply
3	M16×1.5 EMC	Modbus, Profibus
3	M16×1.5 EMC	Ethernet
4	M16×1.5	Power supply

Pos.	Cable gland	Clamping range	Tightening torque
1	M20×1.5	6 to 12 mm	8 Nm
2	M20×1.5 EMC	7 to 12 mm	10 Nm
3	M16×1.5 EMC	3 to 7 mm	5 Nm
4	M16×1.5	4 to 8 mm	6 Nm

… 5 Electrical connections

… Cable glands

Note

Only suited Ex-zone approved cable glands and blind plugs may be used as spare parts.

- The use of other cable glands and blind plugs lead to a loss of Ex-approval!

Pos.	Manufacturer, type	Manufacturer order number
1	Hummel, HSK-M-Ex Metr.	1.640.2000.50
2	Hummel, HSK-M-EMV-Ex	1.616.2000.51
3	Hummel, HSK-M-EMV-Ex Metr.	1.616.1600.51
4	Hummel, HSK-M-Ex Metr.	1.640.1600.50

Specifications for the selection of cable glands	
Thread sizes	M20×1.5; M20×1.5 EMC; M16×1.5; M16×1.5 EMC
Maximum surface roughness	max. Ra = 8 µm
Wall thickness range	EL3060-CU Control unit: 4 to 5 mm EL3060-Uras26 analyzer unit: approx. 23 mm

Unused cable glands

Unused cable glands must be sealed off with sealing plugs.
Cap nuts must be screwed tightly onto the unused cable glands.

Connecting the signal and power supply lines

Mount EMC cable glands

Shielded connection cables must be guided into the terminal box through EMC cable glands, **Assignment of the cable glands** on page 35.

1. Uncover the braided shield of the cable over a length of approx. 10 mm.
2. Loosen the union nut on the cable gland and remove the terminal insert.
3. Slide the union nut and the terminal insert over the cable.
4. Fold the braided shield back over the terminal insert. The braided shield must cover the sealing ring by approx. 2 mm.
5. Guide the terminal insert with the cable into the cable gland and tighten the union nut by hand until resistance can be felt and the gasket rests on the cable.
6. Then tighten the cable gland one more turn.

Mounting standard cable glands

Connection cables without shielding are guided into the terminal box through standard cable glands, see **Assignment of the cable glands** on page 35.

1. Loosen the union nut on the cable gland and remove the sealing ring.
2. Slide the union nut and the sealing ring over the cable.
3. Guide the cable with the sealing ring into the cable gland and tighten the union nut by hand until resistance can be felt and the gasket rests on the cable.
4. Then tighten the cable gland one more turn.

Connecting the power supply to the control unit

1. Make sure that the line voltage is in the permissible range of 100 to 240 V AC.
2. Make sure that the power supply line has an adequately dimensioned protective device (circuit-breaker max. 6 A).
3. Install an easily accessible mains isolator or a switched socket in the power supply line, close to the gas analyzer, so that all the poles of the gas analyzer can be disconnected from the power supply if necessary.
   Label the supply circuit isolator to make it clear that it is associated with the device that needs to be isolated.
4. Connect the power supply line to terminals L, N and PE.
5. Connect the external potential equalization connections of the control unit and the analyzer unit to the local potential equalization.

6 Commissioning

Safety instructions

⚠ DANGER

Risk of explosion!
There is an explosion hazard if the housing is opened in a potentially explosive atmosphere:
- Before opening the housing, make sure that no flammable or potentially explosive atmospheres are present.

NOTICE

Damage to the gas analyzer
Damage to the gas analyzer due to condensing sample gas during commissioning.
- Observe the condition of the sample gas inlet of the analyzer modules.
- Purge the sample gas path before commissioning, see **Pre-purge gas paths** on page 40.
- Do not connect the sample gas until the gas analyzer has reached room temperature and after the warm-up phase has elapsed, see **Duration of the Warm-up Phase** on page 40.

When safe operation can no longer be assured

If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:
- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

Installation Check

NOTICE

Potential adverse effect on the IP rating
Yellow sealing plugs (transport protection) are applied to the gas connections on the analyzer and housing to secure them during transport. The yellow sealing plugs do not guarantee a sufficient IP rating.
- Remove the yellow sealing plugs before commissioning.
- Close unused gas connections with suited sealing plugs to guarantee the IP rating.

Installation location

- Do the conditions at the installation site (zone, explosion group, temperature class) match the information on the name plate?
- Are the control unit and the analyzer unit not being installed outdoors?
- Are the control unit and the analyzer unit securely fastened?

Connection of the gas pipes

- Are all the gas lines connected correctly?
- For the measurement of flammable or corrosive gases, is the terminal of the pressure sensor not connected to the sample gas path?

Connection to potential equalization

- Is the external potential equalization connection of the analyzer unit connected to the local potential equalization?
- Is the external potential equalization connection of the control unit connected to the local potential equalization?

Connection of the electric lines

- Does the line voltage match the permissible operating voltage (100 to 240 V AC, see name plate)?
- Have all electric lines been properly installed and correctly connected to the terminal strip in the terminal box?
- Are there no loose wire ends? Are all unused wires isolated and mechanically secured?
- Have the correct cable types been used for the lines that are guided through the cable glands of the control unit?
- Are the cables firmly seated in the cable glands?
- Have the shielded lines been guided through the EMC cable glands with terminal insert? Has the braided shield been correctly placed on the EMC cable glands?
- Are the 24 V DC connection cable and data transmission cable, which are permanently connected to the EL3060-Uras26 analyzer unit, not shortened to a length of less than 1 m and undamaged?

Integrity of the housing of the EL3060-Uras26 analyzer unit

- Is the housing of the analyzer unit intact?
- Are all flame barriers and screw plugs in place?
- If the analyzer unit is mounted horizontally:
  Are the O-rings that are inserted between the housing base and housing and between the housing and housing cover in the grooves provided for this purpose, clean and not crushed?
- Are all parts of the housing screwed to each other up to the stop and secured against twisting with hexagon screws?

Integrity of the control unit housing

- Is the housing of the control unit intact?
- Is the housing of the control unit tightly sealed?
- Has the housing cover been screwed in as far as it will go and secured against twisting with the hexagon screw?
- Is the gasket in the cover of the terminal box intact? Is the cover of the terminal box tightly sealed?
- Are all cable glands present and securely screwed in?
- Are the openings of the unused cable glands sealed with sealing plugs?

Connection of peripheral devices

- Are all devices needed for gas conditioning, calibration and waste gas disposal correctly connected and ready for use?

… 6 Commissioning

Pre-purge gas paths

Before power-up of the power supply, the gas paths inside and outside of the gas analyzer must be pre-purged.

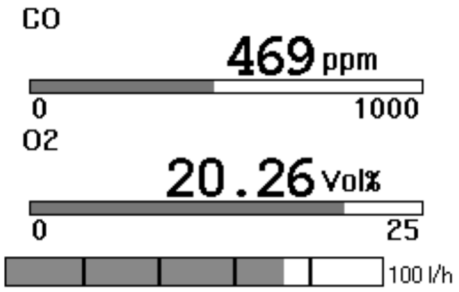
That way, any explosive gas / air mixture which might be present should be removed.

Purge gas data	
Purge gas with non-flammable sample gas	Clean instrument air from non-explosive areas. Quality of the instrument air according to ISO 8573-1 Class 3, i.e.: Particle size max. 40 µm, Oil content max. 1 mg/m^3, Dew point max. 3 °C
Purge gas with flammable sample gas	Nitrogen
Purge gas volume	5 times the volume of the gas paths
Purge gas flow	approx. 30 l/h
Purge time	min. 3 min

Gas analyzer start-up

General description of commissioning

1. Turn on the gas analyzer power supply.
2. During the start-up phase ('Booting'), the LCD display shows the name of the gas analyzer and the number of the software version.
3. At the end of the start-up phase, the LCD display switches over to display the measured values.
   Example:



4. Check the gas analyzer configuration and change if necessary, see **Parameter description** in the operating instruction.
5. Once the warm-up phase is complete, the gas analyzer is ready to begin the measurement process, see **Duration of the Warm-up Phase** on page 40.
6. Check the gas analyzer calibration, see **Calibration** in the operating instruction.
   The gas analyzer is factory calibrated. However, transport influences as well as the pressure and temperature conditions at the installation site can influence the calibration.
7. Turn on the sample gas supply.

Duration of the Warm-up Phase

Analyzer	**Duration of the Warm-up Phase**
Uras26	Without thermostat: approx. ½ h With thermostat: approx. 2.5 h
Magnos28	2 to 4 h The value may be elevated during first commissioning or after a longer service life.
Caldos27	approx. ½ h
Caldos25	1 to 4 h, depending on measurement range

Checking gas path leak tightness

When should gas paths be checked for leak tightness?
The leak tightness of the sample gas path should be checked on a regular basis.

We recommend that you check the leak tightness of the sample gas path prior to commissioning at the installation site, as it may have been affected during transport of the gas analyzer (for example, due to high vibrations).

The leak tightness of the sample gas path must always be checked after the sample gas path has been opened inside the gas analyzer.

⚠ DANGER

Explosion hazard
Explosion hazard due to mixing of air and flammable sample gas residues in the sample gas path.

- If the leak tightness test is to be carried out with air and the sample gas or test gas is flammable, the sample gas path must be rinsed with nitrogen beforehand!
- Otherwise the leak tightness test can be performed with nitrogen.

Check leak tightness
If the sample gas path inside the gas analyzer has been opened, leak tightness should be checked afterwards with a helium leak test for a leakage rate of $< 1 \times 10^{-4}$ hPa l/s.

As an alternative to the helium leak test, the pressure drop method can be used.

- For this purpose, a test pressure of $p_e \sim 400$ hPa for a test duration of 15 min should be applied.
- Within this time, the pressure must not drop more than 1 hPa.

Pressure correction

Menu Path
'▼ Maintenance / ▶ Basic Settings / ▲ Atmospheric Pressure'

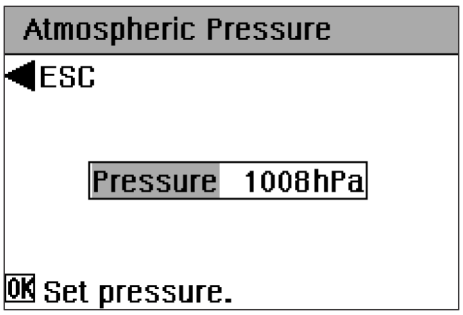


Figure 10: 'Atmospheric Pressure' Menu

Air pressure effect
A change in the atmospheric air pressure compared to the calibration time results in a change in the measured value.

Automatic pressure correction with pressure sensor
If a pressure sensor is installed in the gas analyzer (see **Pressure sensor** on page 20), automatic internal pressure correction minimizes the influence of air pressure changes on the measured value.

Pressure correction with Magnos28
The Magnos28 without a built-in pressure sensor has been calibrated at the factory for an air pressure of 1013 hPa.
If the air pressure at the installation site deviates from 1013 hPa, the current air pressure can be entered manually to correct it.

… 6 Commissioning

… Pressure correction

Calibration of the pressure sensor
If the reading of the built-in pressure sensor differs from the actual air pressure, the pressure sensor can be recalibrated.

Note
- When measuring non-flammable sample gases, the pressure sensor can be connected to the sample gas output line via an external T-piece. In this case, when calibrating the pressure sensor, the sample gas flow must be interrupted so that the sample gas pressure does not falsify the pressure reading.
- After calibration of the pressure sensor, zero point and final point must be checked and recalibrated if necessary.
- The pressure sensor cannot be calibrated while an automatic calibration is in progress.

Calibrating the pressure sensor
1. Select the ‘Air pressure’ menu item.
2. Set the pressure set point.
3. Start adjustment.
4. Calibration in progress.
5. Press **OK** to return to the display of measured value.

Status Signal
While calibrating the pressure sensor, the ‘Function check’ status signal is active, see **"Diagnosis / error messages"** in the operating instruction.

7 Operation

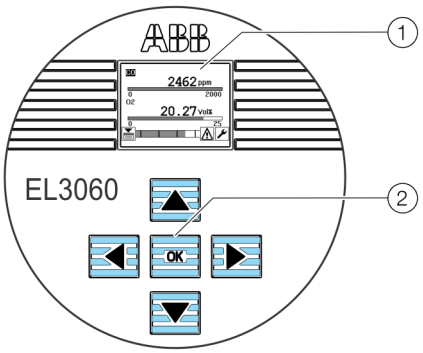
Safety instructions

When safe operation can no longer be assured
If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:
- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

LCD-indicator

Note
All representations of the LCD indicator in these dieser Commissioning Instruction are examples.
The indications on the IED will usually differ from this.



① LCD display
② Operating buttons for menu navigation

Figure 11: LCD indicator on the device

The gas analyzer is operated via the LCD indicator on the device.

LCD display in measurement mode

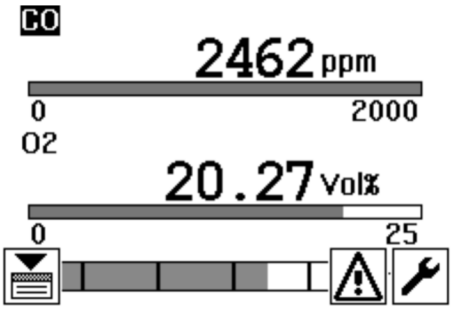


Figure 12: LCD display in measurement mode (example)

In measurement mode, the LCD display displays the name, the measured value in numbers and the physical unit of the measured value for each sample component.

If the name of the sample component flashes alternately with the inverted display, this signals that the measured value is outside the measuring range limits.

Status icons provide information on the operating condition of the gas analyzer.

Status Icons

Icon	Description
	An automatic calibration is in progress, see **Calibration** in the operating instruction.. The icon also appears in menu mode in the menu title line, see **LCD display in menu mode** on page 44Seite - Bedienung - Menübetrieb</dg_ref_source_inline.
	A status message is active, see **"Diagnosis / error messages"** in the operating instruction.
	The status signal 'Maintenance required' is active, see **"Diagnosis / error messages"** in the operating instruction. The icon also appears in menu mode in the menu title line, see **LCD display in menu mode** on page 44.
	The status signal 'Failure' is active (**"Diagnosis / error messages"** in the operating instruction) or the maintenance switch (see See Operating instruction on page 58.) is set to 'On'. The icon is flashing. The icon also appears in menu mode in the menu title line, see **LCD display in menu mode** on page 44.
	The configuration has been saved. The icon is flashing. Do not turn off the power supply of the gas analyzer while the icon is displayed!

… 7 Operation

… LCD-indicator

Key functions in measurement mode

Button	Description
◀ ▶	Toggle to display each individual measured value; in addition to the number display, an analog bar with an indication of the measuring range limits appears on this indicator.
▲ ▼	Decrease or increase the contrast of the LCD display. If a status message is active: First, press the ▲ button.
OK	Switch to menu mode (see **LCD display in menu mode** on page 44).
▼	If a status message is active  : Press the button to display the message list (see **"Diagnosis / error messages"** in the operating instruction).

Number of decimal places

When displaying the measured value in physical units (such as ppm), the number of decimal places depends on how large the span of the set measuring range is.

Measuring span	Decimal places
≤ 0,05	5
≤ 0,5	4
≤ 5	3
≤ 50	2
≤ 500	1
> 500	0

The number of decimal places when setting the parameters is the same as in the display in measuring mode.

LCD display in menu mode

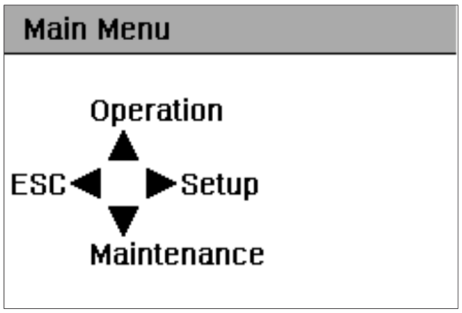


Figure 13: Main menu

Structure of the menu

Each menu (see **Menu Overview** on page 47) from the main menu contains a maximum of three menu items (‘3-tier menu’).

Each menu item is assigned to one of three buttons ▲, ▶ and ▼, therefore each menu item can be selected directly. The ◀ button is always used to return to the next higher menu.

The most commonly needed functions are arranged in the menu in a way that they can be called up by pressing each of the keys repeatedly:
‘▲ Operation / ▲ Calibration / ▲ Manual Calibration / ▲ Zero point / Single point’
‘▶ Setup / ▶ Calibration Data / ▶ Test gas set points’
‘▼ Maintenance / ▼ Diagnosis / ▼ Device status / ▼ Status messages’

Button functions in menu mode

Button	3-tier menu
▲ ▶ ▼	Select menu item
◀	Return to the next higher menu
OK	Return to measurement mode
	Component list
▲ ▼	Select component
▶ or **OK**	Call up selected component for editing
◀	Return to the next higher menu
	Parameter list ('Selector')
▲ ▼	Select parameter
▶	Call up value change
OK	Accept all displayed values and return to the next higher menu
◀	Discard all displayed values and return to the next higher menu
	Change in value
▲ ▼	Change selected item
▶	Select items to be changed
OK	Confirm changed value and return to the parameter list
◀	Discard changed value and return to the parameter list

Password protection

Access to the calibration as well as to the menus where the configuration of the device can be changed can be password-protected. Password protection is not activated at the factory.

Password protection variants:

- Access to calibration can be excluded from password protection.
- Access to all device functions can be password-protected (for devices with SIL certification).

Note

For security reasons it is recommended, to set a password.

Configure password

The password is set in the Configurator in menu 'Options – Password...'. It consists of a 4-digit number; each of the digits may only assume the values of 1, 2 and 3 (for example: '1213'. The setting '0000' means that password protection is not enabled.

… 7 Operation

… LCD-indicator

Enter password

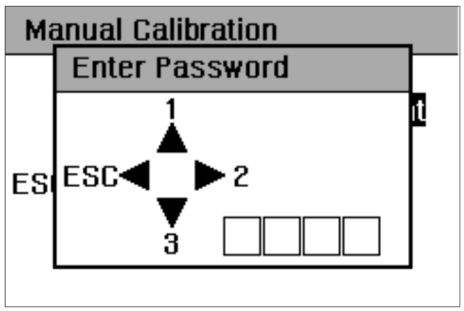


Figure 14: Password entry

As soon as the user wants to access a password-protected menu or a password-protected value change, password entry is prompted.

For this purpose, as shown on the LCD display, the digits 1, 2 and 3 are assigned to three buttons ▲, ▶ and ▼.

Example
If the password set is ‘1213’, the user needs to push the buttons ▲, ▶, ▲ and ▼ one after the other. Each push of a button is acknowledged by displaying the ‘*’ symbol.

The password entered remains active until the user returns to measuring mode or until the gas analyzer automatically switches to measuring mode through the time-out function.

Time out function
If the user does not press a button for more than 5 minutes while selecting menu items, the gas analyzer automatically switches back to measurement mode (see **LCD display in measurement mode** on page 43).

The time-out function is disabled as soon as the user changes the value of a parameter or starts a calibration.

Status messages on the LCD display

Menu path

„▼ Maintenance / ▼ Diagnosis / ▼ Device Status / ▼ Status Messages“

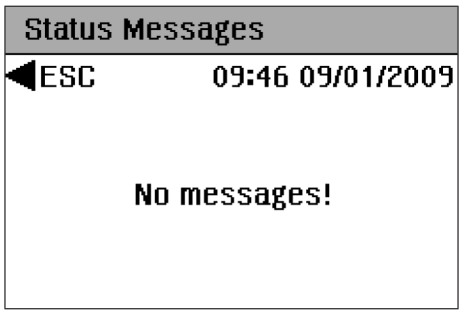


Figure 15: Menu ‘Status Messages’

When a status message is active, the message list display is called up directly by pressing the ▼ button once.

Message list and detailed view

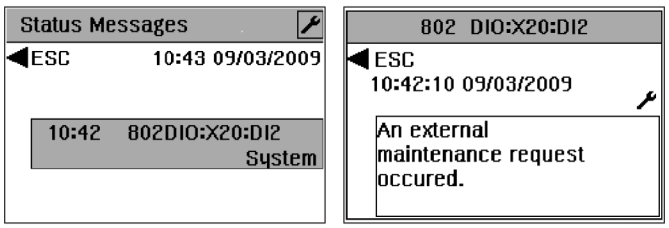


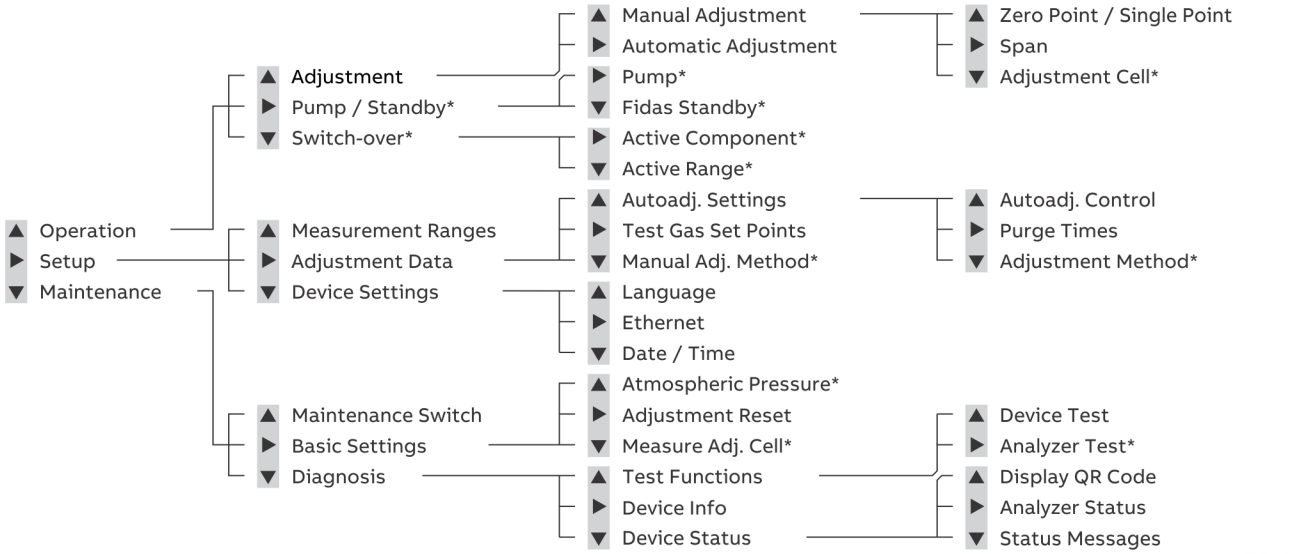
Figure 16: List of status messages and detailed view

The message list with the short text of the status messages is displayed in the ‘Status Messages’ menu.

By pressing the ▶ button, the detailed view of the individual status messages is displayed; in the detailed view, the time and date of occurrence, as well as cancellation or acknowledgment of the status message are displayed.

Note
For a detailed description of errors and information regarding troubleshooting, refer to the chapter titled "Diagnosis / Error messages" in the operating instruction.

Menu Overview



* This menu depends on the configuration of the gas analyzer

Figure 17: Menu overview

Notes on the 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.

… 7 Operation

Communication between gas analyzer and computer

Ethernet communication

The communication between the gas analyzer and the computer runs via an Ethernet connection either as a point-to-point connection or via a network.

The Ethernet connection enables communication

- using the test and calibration software Optima TCT Light,
- using the ECT configuration software,
- for QAL3 data transfer if the 'QAL3 monitoring' option is integrated in the gas analyzer,
- For reading the measured values and calibration and control of the gas analyzer via the Modbus® TCP/IP protocol.

Establishing communication between the gas analyzer and the computer

To establish the communication between the gas analyzer and the computer, the following steps must be performed in particular:

1. Check and set the TCP/IP parameters in the gas analyzer and the computer.
2. Establish and test the Ethernet connection.
3. Establish communication between the gas analyzer and the computer.

Check the TCP/IP parameters in the gas analyzer and in the computer

For operation of the configurator, the TCP/IP parameters must be checked in both the gas analyzer and the computer and changed, if necessary.
In the case of a point-to-point connection, the IP addresses in the gas analyzer and in the computer must be matched.

Example:
Gas analyzer: 192.168.1.4,
Computer: 192.168.1.2

Note
If the gas analyzer is connected to a network without a DHCP server, then the parameter 'DHCP' should be set to 'off'.
This also applies if the gas analyzer is not connected to a network via Ethernet.
This is to prevent the gas analyzer from continuously attempting to establish a network connection.

Setting the IP address

Menu Path

„▶ Setup / ▼ Device Settings / ▶ Ethernet“

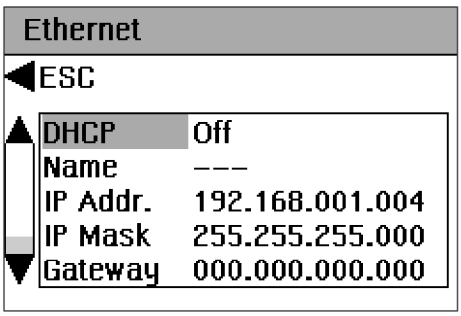


Illustration18: 'Ethernet“' Menu

Parameters

It depends on the DHCP settings what parameters need to be integrated:

DHCP setting	Parameter
DHCP on	Network name (max. 20 characters, no empty and special characters),
DHCP off	IP address, IP address mask and IP gateway address.

The network name can only be changed in the Configurator. The default network name consists of 'EL3K' and the last six characters of the MAC address (for example, 'EL3KFF579A').

If the parameter 'DHCP' is set to 'off', the Ethernet configuration is set to the default configuration (default IP address) in order to avoid unintentional assignment of an IP address from a DHCP pool.

Adresses

The IP address, IP address screen and IP gateway address need to be queried from the system administrator.

Note
The address bits variable from the address screen may not be set to 0 or 1 (broadcast addresses).

MAC address

The 12 character MAC address is unique worldwide and is stored in the device during manufacture. It cannot be changed.

Setting the IP address in the computer

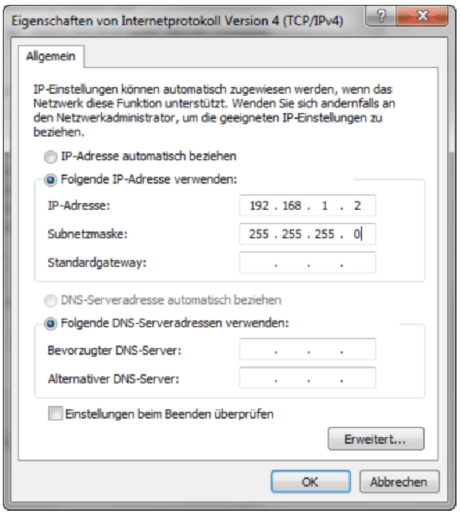


Figure 19: Microsoft Windows® IP properties (example)

1. Call up ‘Start’ → ‘System control’ → ‘Network and release center’.
2. Click on ‘Change adapter settings’.
3. Right-click on ‘Ethernet’ (Windows 10®) or ‘Local Area Connection’ (Windows 7®) → ‘Properties’
4. in the network tab → double-click on ‘Internet Protocol Version 4 (TCP/IPv4)’
5. In the ‘General’ tab, you can configure the IP settings (see **Setting the IP address** on page 48) appropriate for the configuration of the gas analyzer and confirm the settings by clicking on ‘OK’.

Establishing and testing the Ethernet connection

Cables

The cables are standard Ethernet cables and are in the scope of delivery of the gas analyzer.

Testing the Ethernet connection

1. Call up ‘Start’ → ‘Input request’.
2. Enter ‘ping IP-Adresse’ (along with the IP address of the gas analyzer) and press the Enter button.

If the connection is OK, the gas analyzer reports: ‘Response from IP address: Bytes=32 Time<10ms TTL=255”
(the numbers are device-specific).

If the message ‘Request timeout’ appears, the connection is not OK.

The network name of the gas analyzer can also be entered instead of the IP address.

Establish communication between configurator and gas analyzer

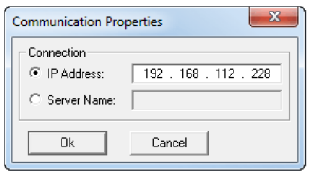


Figure 20: ‘Communication Properties’ menu in ECT

The communication between the configurator and the gas analyzer is established in the ‘Options / Communication Properties...’menu or by clicking on the icon.
Either the IP address or the network name (server name) of the gas analyzer should be entered.

Receiving configuration data

Once communication is established, configuration data can be received from the gas analyzer.

‘File / Receive Data’ menu or icon.

Sending configuration data

Once the configuration data has been processed, it can be sent to the gas analyzer.
The configuration is active after an automatic restart of the gas analyzer.

‘File / Send Data’ menu or icon.

Saving configuration data

The gas analyzer configuration data can be stored on the computer.
The saved configuration file can be processed later and sent to the gas analyzer.

‘File / Save As...’ menu or icon.

… 7 Operation

… Setting the IP address

Release of communication via Modbus® TCP/IP

In the EasyLine EL3060, communication via Modbus® TCP/IP is blocked on all Ethernet interfaces by default.

Note

The Modbus® protocol is an unsecured protocol (in the meaning of IT security or cybersecurity), as such the intended application should be assessed before implementation to make sure that the protocol is suited.

Release communication via Modbus® TCP/IP

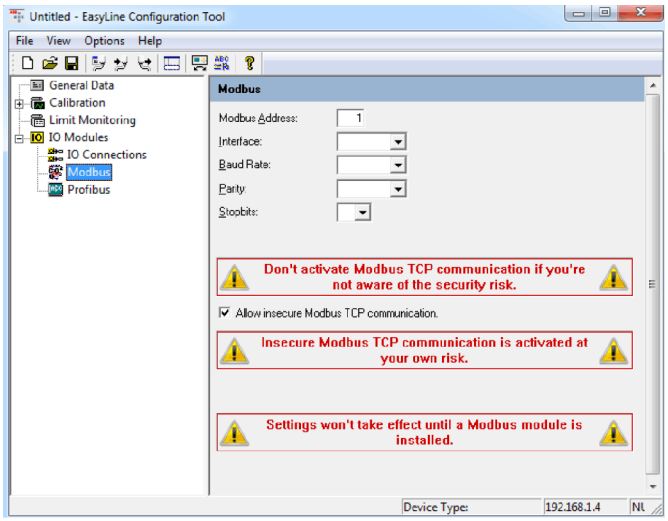


Figure 21: Modbus configuration in ECT

Implement the following steps to release communication via Modbus TCP/IP:

1. Select '…\IO Modules\Modbus' in the menu tree of the ECT Controller.
2. Select the '☑ Allow insecure Modbus TCP communication' checkbox.
3. Set the required Modbus parameters, save the settings and transfer them to the gas analyzer.
4. Communication via the Modbus TCP/IP protocol has now been released.

Note

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

8 Maintenance

Safety instructions

⚠ DANGER

Explosion hazard

There is a risk of explosion if the device is opened in a potentially explosive atmosphere.

Please take note of the following information before opening the device:

- A valid fire permit must be present.
- Make sure that there is no explosion hazard.

⚠ DANGER

Risk of explosion during maintenance of the device

While the device or its components are being maintained/serviced, there is no explosion protection.

- ensure that no potentially explosive atmosphere can occur.

⚠ WARNING

Risk of injury

Risk of injury due to maintenance work being carried out incorrectly.

The work described in this chapter requires special knowledge and may require work to be done on the gas analyzer while it is open and under voltage!

- Maintenance work on the gas analyzer should be performed by qualified and specially trained personnel only !
- Only work on an open and live gas analyzer if it is absolutely necessary to do so.

Note

For detailed information on the maintenance of the device, consult the associated operating instructions (OI)!

9 Decommissioning

Decommissioning the gas analyzer

In the case of a temporary shutdown:

1. Shut off the sample gas.
2. Purge the gas lines and gas feed paths in the gas analyzer with dry air or nitrogen for at least 5 minutes.
3. Switch off the gas analyzer power supply.

In the case of a long-term shutdown, carry out the following in addition:

4. Remove the gas lines from the gas analyzer ports. Tightly seal the gas ports.
5. Disconnect the electrical leads from the gas analyzer.

… 9 Decommissioning

Packing the Gas Analyzer

1. Remove adapters from the gas ports and tightly seal the gas ports.
2. If the original packaging is not available, wrap the gas analyzer in bubble wrap or corrugated cardboard. For overseas shipment, always add a desiccant (e.g., silica gel) and hermetically seal the gas analyzer plus desiccant in a layer of polythene that is 0.2 mm thick. The amount of drying agent should be appropriate for the package volume and the expected shipping duration (at least 3 months).
3. Pack the gas analyzer in an adequately sized box lined with shock-absorbing material (foam or similar). The thickness of the shock-absorbing material should be adequate for the weight of the gas analyzer and the mode of dispatch. When shipping overseas, additionally line the box with a double layer of bitumen paper.
4. Mark the box as "Fragile Goods".

Note

If the device is returned to ABB Service (e.g. for repair), the following points must be observed:

- It is essential that the gases that were introduced into the gas analyzer are specified on the return form (see page 59).
- See the information in **Returning devices**!

Transport-/Storage temperature

–25 to 65 °C

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see **Return form** on page 59) and include this with the device.
In accordance with the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Address for the return:

ABB AG
Service Analysentechnik – Parts & Repair
Stierstädter Straße 5
60488 Frankfurt
Germany
Fax: +49 69 7930-4628
Email: repair-analytical@de.abb.com

10 Recycling and disposal

Note

Products that are marked with the adjacent symbol may **not** be disposed of as unsorted municipal waste (domestic waste).
They should be disposed of through separate collection of electric and electronic devices.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:

- As of 8/15/2018, this product will be under the open scope of the WEEE Directive 2012/19/EU and relevant national laws (for example, ElektroG - Electrical Equipment Act - in Germany).
- The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment properly, our Service can take care of its pick-up and disposal for a fee.

11 Specification

Note
The device data sheet is available in the ABB download area at www.abb.de/analytical.

Note regarding the analyzers performance characteristics

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

… 11 Specification

Uras26

Stability

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

Linearity error

≤ 1 % of measuring span

Repeatability

≤ 0.5 % of span

Zero drift

≤ 1 % of span per week;
for measuring ranges smaller than Class 1* to Class 2*:
≤ 3 % of span per week

* See 'Sample components and measuring ranges' in data sheet DS/EL3060.

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)

Influences

Flow effect

Flow rate in range of 20 to 100 l/h:
≤ 1 % of span at a flow rate 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 the 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 the sensitivity with temperature compensation: ≤ 3 % of the measured value per 10 °C
- On the sensitivity with thermostat effect (optional):
  ≤ 2 % of the measured value per 10 °C

Thermostat temperature = 61 °C

Air pressure effect

- At the zero point:
  no influence effect
- On sensitivity with pressure correction using an integrated pressure sensor:
  ≤ 0.2 % of the measured value per 1 % of 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 T90 time = 0 s

Magnos28

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

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 gauge pressure) at a sample gas flow = 90 l/h and electronic T_{90}time (static/dynamic) = 3/0 s, gas change from nitrogen to air.

… 11 Specification

Caldos27

Stability

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

Linearity error

≤ 2 % of the span

Repeatability

≤ 1 % of measuring span

Zero drift

≤ 2 % of smallest possible measuring range per week

Span drift

≤ 0.5 % of the smallest provided measuring range per week

Output signal fluctuation (2 σ)

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

Detection limit (4 σ)

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

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.

In any point of the measuring range:

≤ 1 % of span per 10 °C, based on the temperature at the time of 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.

Optional: Operating altitude over 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

Caldos25

Stability

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

Linearity error

≤ 2 % of the span

Repeatability

≤ 1 % of measuring span

Zero 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 sec

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.
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.
In any point of the measuring range:
≤ 1 % of span per 10 °C, based on the temperature at the time of calibration.
Thermostat temperature = 68 °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; Optional: T_{90} <6 s

12 Additional documents

Note

All documentation, declarations of conformity, and certificates are available in ABB's download area.
www.abb.com/analytical

Trademarks

13 Appendix

Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.
Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:	
Address:	
Contact person:	Telephone:
Fax:	Email:

Device details:

Type:	Serial no.:
Reason for the return/description of the defect:	

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items):

☐ biological	☐ corrosive / irritating	☐ combustible (highly / extremely combustible)
☐ toxic	☐ explosive	☐ other toxic substances
☐ radioactive		

Which substances have come into contact with the device?

1.
2.
3.

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date	Signature and company stamp

ABB Measurement & Analytics

For your local ABB contact, visit:
www.abb.com/contacts

For more product information, visit:
www.abb.com/analytical

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