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:

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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.

Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

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 12.

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 17.

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.

Dies schließt auch das zugeführte Messgas ein.

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).

... 1 Safety

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.

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

… 1 Safety

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** on page 77. 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 Operating 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.

… 2 Use in potentially explosive atmospheres

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 9.

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 ≠ 0

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 28.
- 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 Design and function

Variants

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

Properties

Control unit

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

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

Caldos25, Caldos27, and Magnos28 analyzers

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

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

Uras26 analyzer

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

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

Gas connections

All gas connections are guided through flame barriers.

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

Housing purge

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

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

Note

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

4   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.

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.

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).

... 4 Preparation for Installation

... Material required for installation

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.

Power supply

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)

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.

... 4 Preparation for Installation

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.

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**.
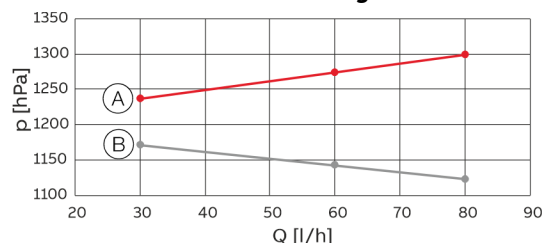
 Ⓐ Maximum inlet pressure   Ⓑ Maximum outlet pressure
p Pressure   Q Flow rate

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

... 4 Preparation for Installation

... Sample gas inlet conditions with gauge pressure in the sample gas feed path

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

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 **Uras26 – Instructions for calibration** on page 60.

... 4 Preparation for Installation

... Samples Gases for the Calibration

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 **Magnos28 – notes for calibration** on page 62.

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 **Caldos27 – Notes for calibration** on page 63.

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 **Caldos25 – notes for calibration** on page 64.

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 98) 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.

... 4 Preparation for Installation

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 30)
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 21) must not be connected to the sample gas path when measuring flammable or corrosive gases.
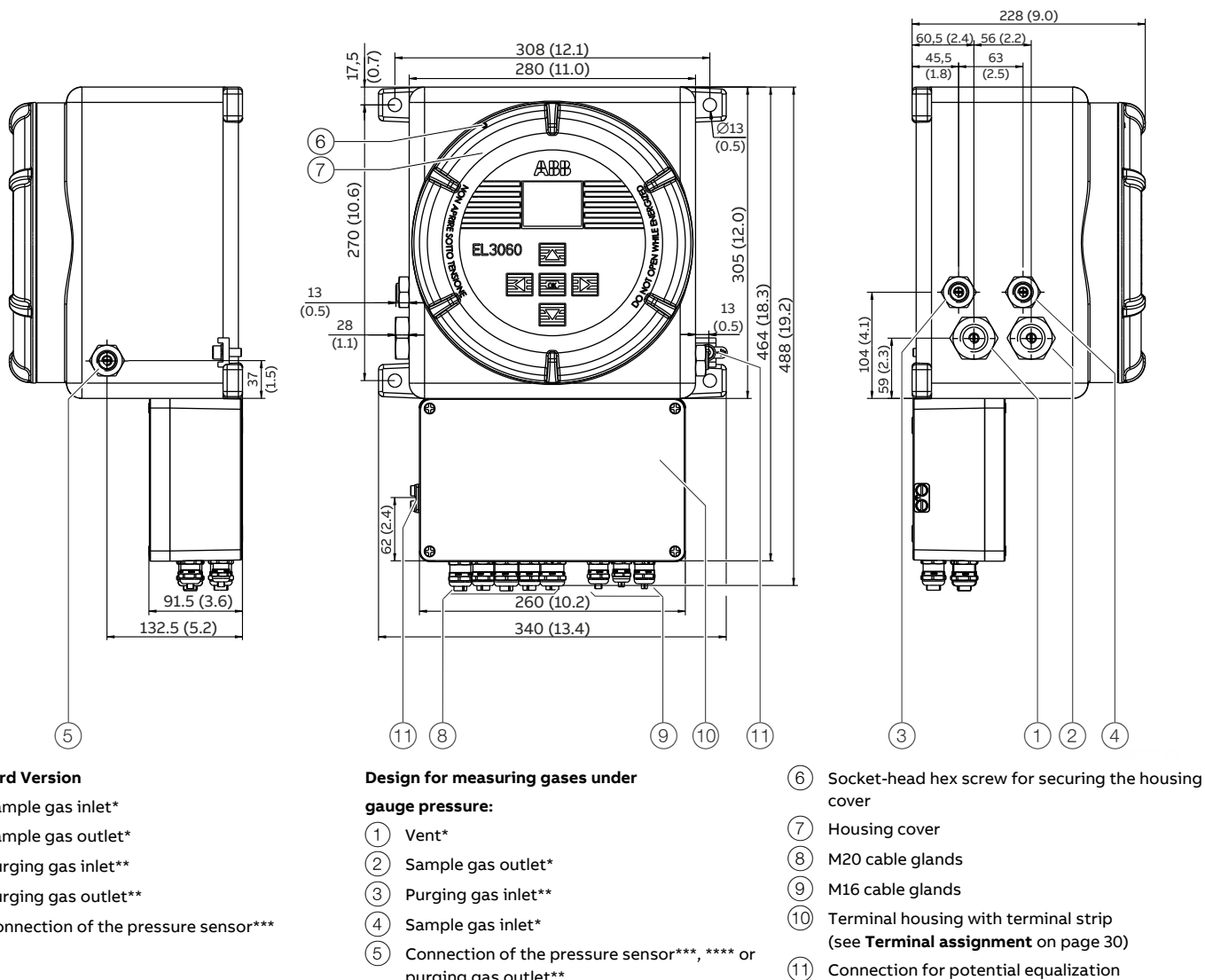**** not in the design with housing purge

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).

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 21) 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).

5   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 13) 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 **Notify Service** on page 94.
   • 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 Operating Instruction.

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 22.

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 the leak tightness of the sample gas or reference gas path** on page 102.

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.

... 5 Installation

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 page 14) should be provided on-site.
The installation site must fulfill the requirements in accordance with **Requirements for the installation site** on page 14.

The control unit must be installed in such a way that the terminal housing faces downwards, see **EL3060-CU control unit** on page 22.

Installation of the EL3060-Uras26 analyzer unit
The material for installation (see page 14) should be provided on-site.
The installation site must fulfill the requirements in accordance **Requirements for the installation site** on page 14.

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 23 – 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 23 – 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 41.
> • 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 51.

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 22.

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.

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 98) 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.

... 5 Installation

... Connecting the gas lines

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!

6 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 38.

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.

... 6 Electrical connections

Terminal assignment

Terminal groups: A, B, C, D, E, F, G, H, I, J, K

Terminal	Upper label	Terminal	Lower label
35	GND	1	DI1–
36	GND	2	DI2–
37	GND	3	DI3–
38	GND	4	DI4–
39	GND	5	DI1–
40	GND	6	DI2–
41	GND	7	DI3–
42	GND	8	DI4–
43	DO1 Common	9	DO1 NO
44	DO2 Common	10	DO2 NO
45	DO3 Common	11	DO3 NO
46	DO4 Common	12	DO4 NO
47	DO1 Common	13	DO1 NO
48	DO2 Common	14	DO2 NO
49	DO3 Common	15	DO3 NO
50	DO4 Common	16	DO4 NO
51	AO1–	17	AO1 +
52	AO2–	18	AO2 +
53	AO3–	19	AO3 +
54	AO4–	20	AO4 +
55	RxD	21	SPI1
56	TxD	22	SPI2
57	GND	23	SPI3
58	RTxD–	24	SPI4
59	RTxD+	25	SPI5
60	GND	26	SPI6
61	RxD/TxD-P	27	SPI7
62	DGND	28	SPI8
63	RxD/TxD-N	29	SPI9
64	+	30	TD+
65	–	31	TD–
66	GND	32	RD+
67		33	RD–
68	+24V	34	GND

K: L, N, ⏚

L: Data transmission EL3060-Uras26
M: Ethernet interface

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).

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 **Configuring signal inputs and outputs** on page 74).

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

... 6 Electrical connections

... Terminal assignment

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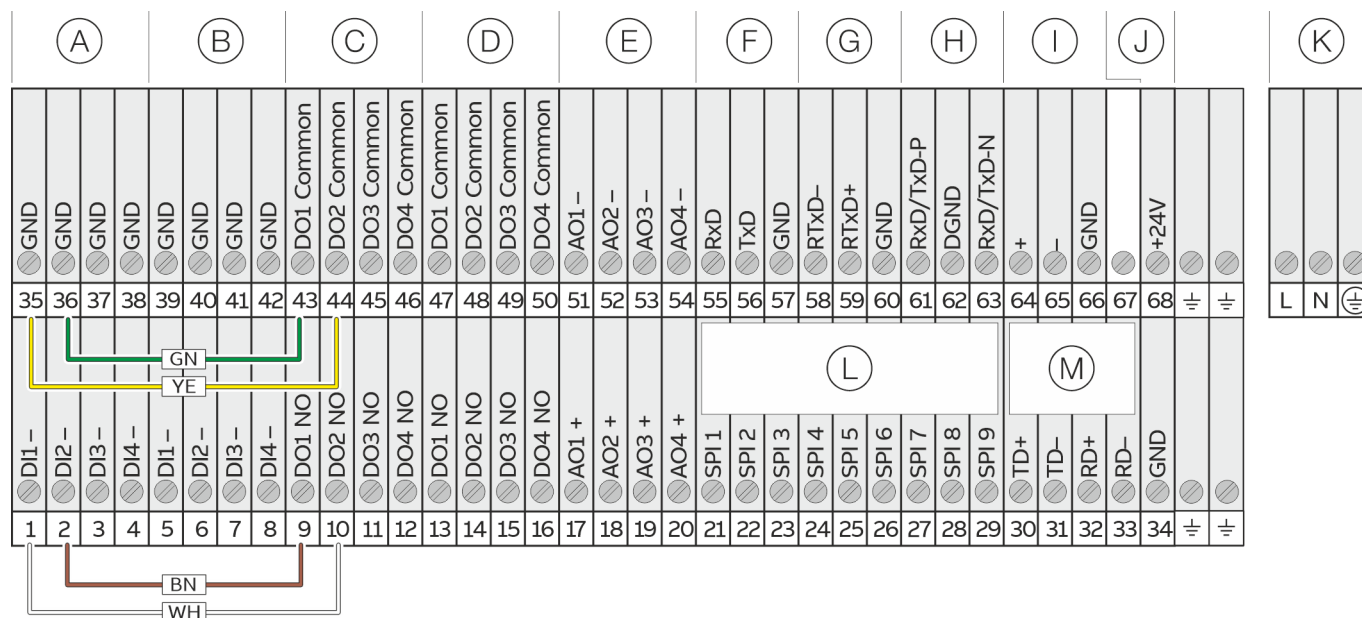
A	Digital inputs Digital I/O module 1	H	PROFIBUS RS485 interface
B	Digital inputs Digital I/O module 2	I	PROFIBUS MBP
C	Digital outputs Digital I/O module 1	J	24 V DC power supply for EL3060-Uras26
D	Digital outputs Digital I/O module 2	K	Power supply 100 to 240 V AC
E	Analog outputs	L	Data transmission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

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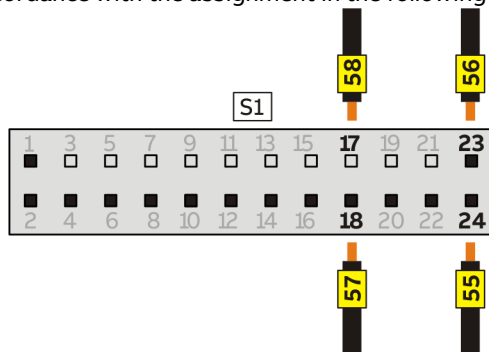
4. Insulate the ends of the unused wires 59 and 60 in the appropriate manner.

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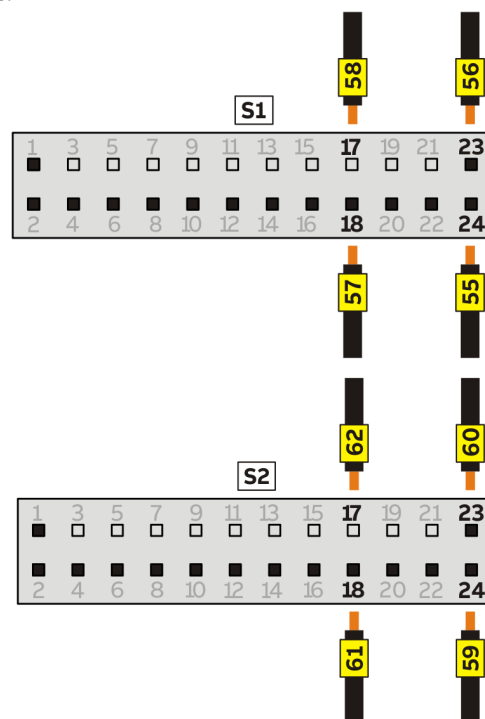
4. Insulate the end of unused wire 63 in the appropriate manner.

Terminal assignment of the terminal blocks after the conversion
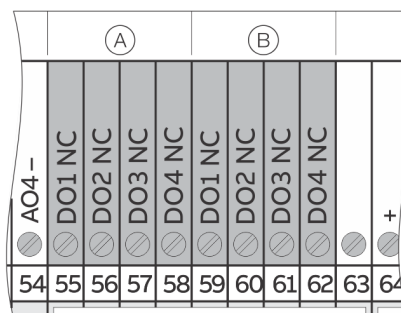
(A) Digital outputs DI/DO-Module 1   (B) Digital outputs DI/DO-Module 2

Figure 6:   New assignment of terminals 55 to 63

... 6 Electrical connections

... Terminal assignment

Analog outputs

0/4 to 20 mA (see **Configuring signal inputs and outputs** on page 74, 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 24..

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	③	M16×1.5 EMV
②	M20×1.5 EMC	④	M16×1.5
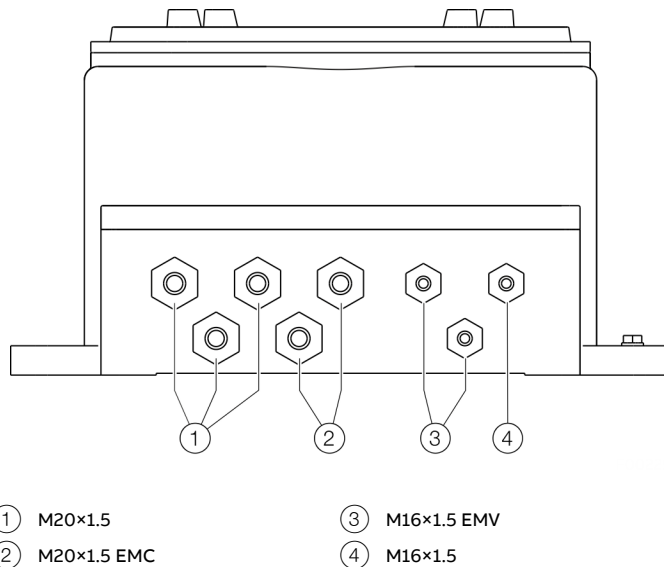
Figure 7: Assignment of the cable glands

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

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 38.
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 30.

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 38.
2. Connect the wires to terminals 61 and 63, see **Terminal assignment** on page 30.
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.
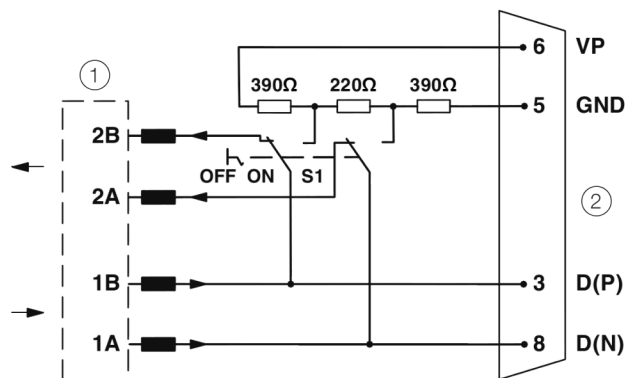
① Terminals   ② D-SUB connector

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.

... 6 Electrical connections

... Terminal assignment

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:	Wires 1 to 9
Terminals 21 to 29:	(printed on the wires)
Assignment:	Terminal 21 – Wire 1 to Terminal 29 – Wire 9
Power supply:	(+24V, wire with red marking),
Terminals 34 (GND) and 68	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	③	M16×1.5 EMV
②	M20×1.5 EMC	④	M16×1.5
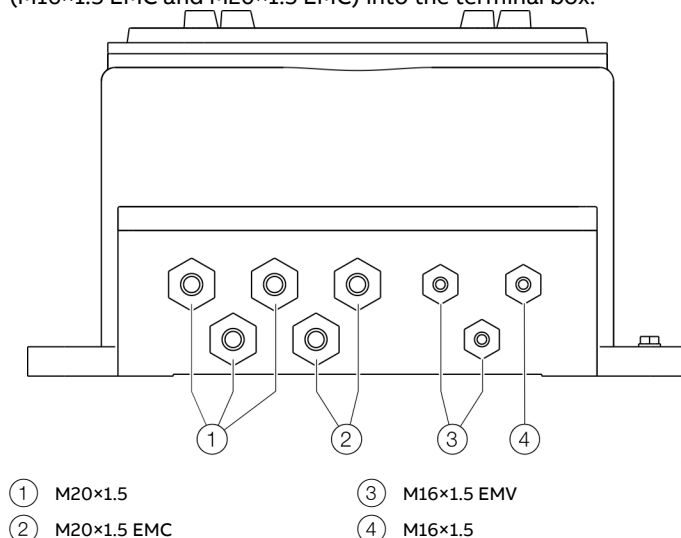
Figure 9:   Assignment of cable glands EL3060-CU control unit

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

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.

... 6 Electrical connections

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 36.

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 36.

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.

7 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 41.
- 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 41.

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?

... 7 Commissioning

... Installation Check

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?

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:
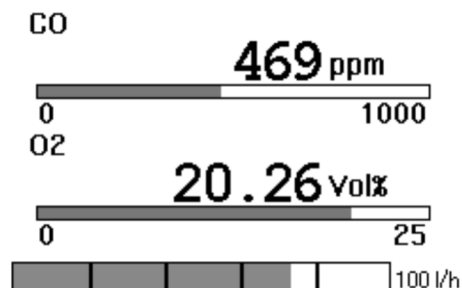
4. Check the gas analyzer configuration and change if necessary, see **Configuration** on page 65.
5. Once the warm-up phase is complete, the gas analyzer is ready to begin the measurement process, see **Duration of the Warm-up Phase** on page 51.
6. Check the gas analyzer calibration, see **Calibration** on page 50.
   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

8   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 Operating Instruction are examples.
The indications on the IED will usually differ from this.
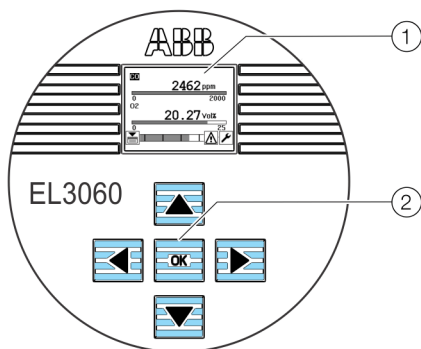
① LCD display
② Operating buttons for menu navigation

Figure 10:   LCD indicator on the device

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

LCD display in measurement mode
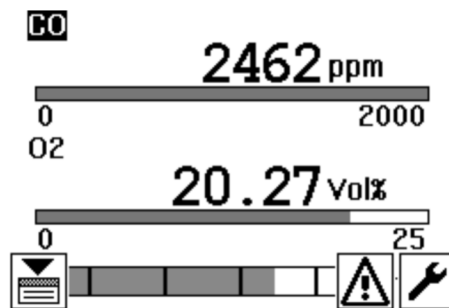
Figure 11:   LCD display in measurement mode (example)

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 page 53.. The icon also appears in menu mode in the menu title line, see **LCD display in menu mode** on page 43Seite - Bedienung - Menübetrieb</dg_ref_source_inline.
	A status message is active, see page 86.
	The status signal 'Maintenance required' is active, see page 86. The icon also appears in menu mode in the menu title line, see **LCD display in menu mode** on page 43.
	The status signal 'Failure' is active (**Status messages – Explanations** on page 86) or the maintenance switch (see **Maintenance switch** on page 96) 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 43.
	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!

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 43).
▼	If a status message is active : Press the button to display the message list (see **"Status messages" table** on page 89).

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.
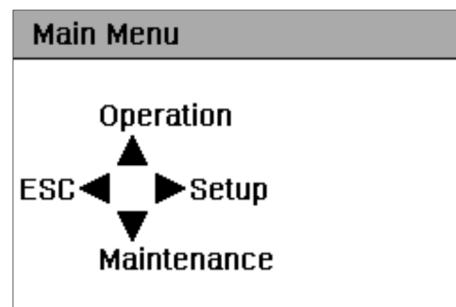
LCD display in menu mode

Figure 12: Main menu

Structure of the menu

Each menu (see **Menu Overview** on page 45) 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'

... 8 Operation

... LCD-indicator

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

Enter password
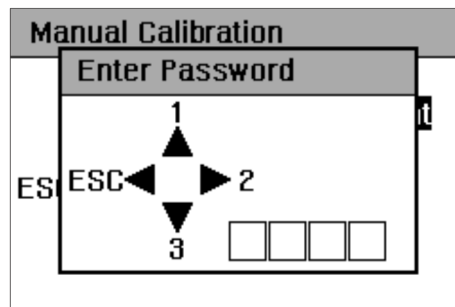
Figure 13:   Password entry

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 42).

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

Menu Overview

▲ Operation
▶ Setup
▼ Maintenance

▲ Adjustment
▶ Pump / Standby*
▼ Switch-over*

▲ Manual Adjustment
▶ Automatic Adjustment
▶ Pump*
▼ Fidas Standby*
▶ Active Component*
▼ Active Range*

▲ Zero Point / Single Point
▶ Span
▼ Adjustment Cell*

▲ Measurement Ranges
▶ Adjustment Data
▼ Device Settings

▲ Autoadj. Settings
▶ Test Gas Set Points
▼ Manual Adj. Method*
▲ Language
▶ Ethernet
▼ Date / Time

▲ Autoadj. Control
▶ Purge Times
▼ Adjustment Method*

▲ Maintenance Switch
▶ Basic Settings
▼ Diagnosis

▲ Atmospheric Pressure*
▶ Adjustment Reset
▼ Measure Adj. Cell*
▲ Test Functions
▶ Device Info
▼ Device Status

▲ Device Test
▶ Analyzer Test*
▲ Display QR Code
▶ Analyzer Status
▼ Status Messages

*   This menu depends on the configuration of the gas analyzer

Figure 14:   **Menu overview**

... 8 Operation

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.

Overview of functions

Function	Device	Configurator	Modbus
Automatic Calibration			
Start/cancel automatic calibration (can also be done via digital inputs)	X		X
Power-up/power-down a cyclically timed automatic calibration, see **Automatic calibration: Control** on page 53	X	X	X
Cycle time of automatic calibration.		X	
End-point calibration together with zero point calibration		X	X
Date and time of next automatic calibration (start of cycle)	X	X	
Test gas concentration, see **Set test gas concentration** on page 52	X	X	X
Purge time	X	X	
Output current behavior (for automatic and manual calibration)		X	
Calibration method (Magnos28)	X	X	
Manual Calibration			
Calibration method	X	X	
Test gas concentration, see **Set test gas concentration** on page 52	X	X	
Perform calibration	X		
Maintenance functions			
Calibration reset, see **Perform calibration reset** on page 97	X		
Calibrate pressure sensor / set air pressure value, see **Pressure correction** on page 98	X		
Measuring the calibration cell, see **Uras26 – measuring the calibration cell** on page 97	X		
Drift, Delta drift, see **Drift indicator** on page 98 (display)	X		X
Software version, see **Instrument information** on page 102	X	X	
Status information, see **Possible status messages** on page 89	X		X
Component parameters			
Measuring range parameters, (see **Measuring range switchover** on page 65)	X	X	
Limit value parameters, see **Limit values** on page 70		X	
Low pass time constant, T90 time, filter, see **Set low-pass time constant** on page 71		X	X
Active component, (see **Active Component Selection** on page 72)	X	X	X
Measuring range, (see **Caldos27 – configure and calibrate sample components** on page 73)		X	
Modbus® parameters*		X	
Profibus® parameters**		X	
Ethernet parameters, see **Setting the IP address** on page 75	X	X	
Signal inputs and outputs, see **Configuring signal inputs and outputs** on page 74		X	

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

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

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"

Illustration15: '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.

... 8 Operation

... Setting the IP address

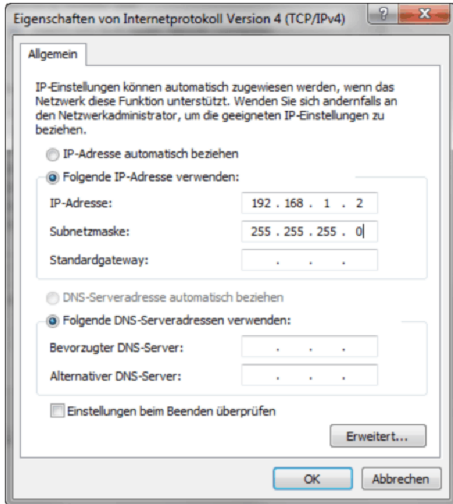**Setting the IP address in the computer**

Figure 16:   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 47) 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
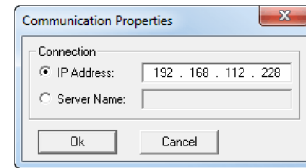
Figure 17:   'Communication Properties' menu in ECT

The communication between the configurator and the gas analyzer is established in the 'Options / Communication Properties…'menu or by clicking on the ![icon] 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] 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] 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] icon.

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.
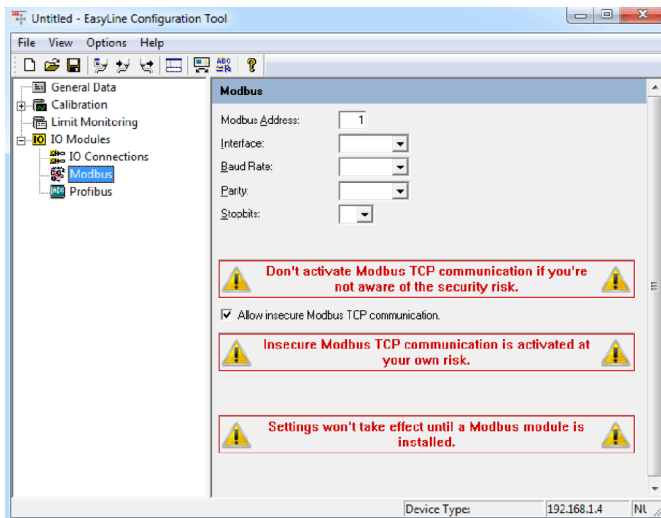
Release communication via Modbus® TCP/IP

Figure 18: 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'.

9 Calibration

Calibration control

Manual and automatic calibration

Manual Calibration
Manual calibration is normally controlled on the display and operation unit of the gas analyzer separately for each sample component.
Refer to **Manual calibration: execution** on page 59.

Automatic calibration
Automatic calibration is usually started cyclically on a time-controlled basis by the internal clock of the gas analyzer jointly for all sample components.
- Automatic calibration can also be started by an external control signal or via the Modbus as well as manually on the display and operation unit of the gas analyzer.
- Automatic calibration can be blocked by an external control signal or via the Modbus.

Refer to **Automatic calibration: Control** on page 53.

Status signal during calibration
The 'Function check' status signal is set during calibration.

For automatic calibration, this is the time period from the gas switch from sample gas to test gas to maximum 4× the longest set low-pass time constant (see **Set low-pass time constant** on page 71) plus the purge time after the new gas switch from test gas to sample gas.

There are two cases distinguished for manual calibration:
- If no valves are configured, the status signal goes out when leaving the calibration menu.
- If at least one sample gas valve (or a digital output with valve function) is configured, the status signal goes out after a maximum of 4× the longest set low pass time constant plus the purge time after the new gas switch from test gas to sample gas.

Depending on the configuration of the signal inputs and outputs (see **Configuring signal inputs and outputs** on page 74), the status signal is issued with the 'Function check' function on a digital output.

Current output signal during calibration
In the configurator, it is possible to set whether the current signals on the analog outputs
- can follow measurement value changes during calibration.
- are held at the last measured value prior to starting calibration or

If the current signals are configured to 'Hold', the analog outputs are held until the 'Function check' status signal has been cleared.

Limit values during calibration
If limit values are activated, they are also active during calibration, see **Limit values** on page 70.

Limit value monitoring is not active during calibration if the current signals are configured to 'Hold', see **Output current response** on page 55.

Plausibility Check during calibration

If during calibration, the gas analyzer finds implausible values (e.g. if the end-point and zero point values are equal), the calibration is aborted and the device issues a status message 503 (see **Possible status messages** on page 89).
The values stored for the last calibration remain in effect.

Wait until the Warm-up Phase has ended

The analyzer module may not be calibrated until the warm-up phase has ended, see **Duration of the Warm-up Phase** on page 41.

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

Air pressure effect

The current air pressure must be taken into consideration during the calibration.

- Air pressure correction is automatically performed when a pressure sensor is fitted to the analyzer, see **Pressure sensor** on page 21.
- In the case of analyzers without a pressure sensor, the current air pressure must be entered via the 'Atmospheric Pressure' menu before calibration, see **Pressure correction** on page 98.

Test gases

> ⚠ **DANGER**
>
> **Explosion hazard**
> Explosion hazard due to the formation of explosive gas mixtures when measuring flammable gases and connecting oxygen-containing test gases (such as air).
> - Before connecting an oxygen-containing test gas, the gas path must be rinsed with an inert gas, such as nitrogen.
> - Observe the following **safety instructions regarding calibration**.

Safety instructions for calibration

When measuring flammable gases, observe the following instructions:

- When calibrating the analyzers, air must not directly be connected as a test gas after operation with flammable gases.
- Alternatively, where possible, use nitrogen as the test gas for calibration instead of air (for example, for zero-point calibration of Uras26 or single-point calibration of Magnos28).
  This must be particularly considered for automatically controlled calibration processes, since no automatic purging with an inert gas is possible.

Dew point of the test gases

The dew point of the test gases must be approximately equal to the dew point of the sample gas, i.e. it must be at least 5 °C lower than the lowest ambient temperature in the entire gas path.

Test gas flow rate

30 to 60 l/h, keep constant at ±5 l/h

... 9 Calibration

... Test gases

Test gas supply

The sample gas must be connected to the sample gas inlet of the gas analyzer:
- Either with an external solenoid valve controlled via digital output DO4 on Digital I/O Module 1, see **Standard assignment of digital inputs and digital outputs** on page 31.
- Or with three external solenoid valves for sample gas, zero point gas and span gas, each controlled via an appropriately configured digital output, see **Standard assignment of digital inputs and digital outputs** on page 31.
- Or with a multi-way valve.

Test gas supply control for automatic calibration

The prerequisite for the automatic calibration process is that at least one external solenoid valve is installed, which is controlled via an appropriately configured digital output.

Especially in the case where automatic calibration is performed as a simplified calibration (calibration cells, single-point calibration), the required test gas (zero point gas, air or standard gas) must be applied to an external solenoid valve.

Set test gas concentration

Menu path
'▶ Setup / ▶ Calibration Data / ▶ Test Gas Set Points'
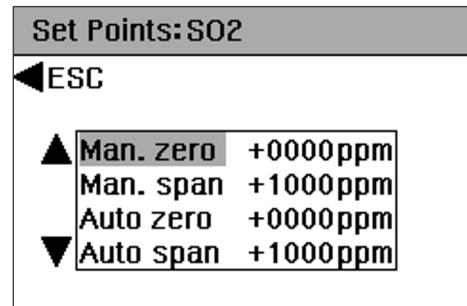
Figure 19:   "Set points' menu

Test gas concentration

The set points of the test gas concentrations for zero and end-point calibration must be set separately for manual and automatic calibration.
The set points of the test gas concentrations for the manual calibration can also be set during the calibration process as well as in the configurator.

Zero point set point

Value range: Initial value of the physical measuring range minus 20 % of the measuring span to the final value of the physical measuring range.
Refer to **Configuration** on page 65.

End-point set point

Value range: Initial value of the physical measuring range up to the final value of the physical measuring range plus 20 % of the measuring span.
Refer to **Configuration** on page 65.

Automatic calibration: Control

Starting automatic calibration
Cyclic timed start
Automatic calibration is normally started cyclically on a time-controlled basis by the internal clock of the gas analyzer.
The cycle time is set in the configurator.

Externally controlled start
For external starting of the automatic calibration, a control signal is required at the digital input DI1 'Start automatic calibration' on the digital I/O module 1 (default configuration).

Control signal requirements:
    Refer to **Terminal assignment** on page 30.
    The control signal must be present for at least 1 s.

To stop the automatic calibration externally, another digital input must be configured.
The control signal must fulfill the same requirements as the signal for the external start.
Automatic calibration can also be started and stopped via Modbus.

Manual Start
The automatic calibration can be manually started on the display and control unit.
Refer to **Automatic calibration: manual start** on page 57.

Blocking automatic calibration
To block automatic calibration, a control signal (high level) at the digital input DI2 'Block automatic calibration' on the Digital I/O module 1 (default configuration) is needed.
  - As long as the control signal is present (high level), automatic calibration is blocked.
  - If the control signal is activated at a point in time at which a cyclically controlled automatic calibration would start, this calibration will be suppressed.
    – In this case, the automatic calibration is triggered immediately after switching to the low level.
    – if the automatic calibration cycle set in the configurator is not affected by this, the interval to the next automatic calibration will then be shorter.
  - Powering up the control signal causes an ongoing automatic calibration to be aborted.
    After switching the control signal to low level, the next automatic calibration takes place according to the cycle time set in the configurator.

Control signal requirements:
    Refer to **Terminal assignment** on page 30.
    The control signal must be present for at least 1 s.

Automatic calibration can also be blocked via the Modbus.

Process display
The status appears on the LCD display during automatic calibration, see **Status Icons** on page 43.
The status message 'Autocalibration running' is active and the status signal 'Function check' is set.

Note
  - The automatic calibration must not be triggered while the gas analyzer is being operated using the test and calibration softwareOptima TCT Light.
  - When an automatic calibration is running, it is not possible to perform a manual calibration, measure a calibration cell, or perform a calibration reset.

... 9 Calibration

Automatic calibration: settings

Menu path
'▶ Setup / ▶ Calibration Data / ▲ Autocal. Settings'

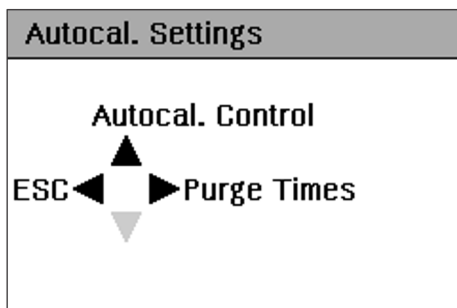Figure 20:   'Auto Calibration -settings' menu

Settings in the configurator and in the device
All automatic calibration parameters can be set in the configurator.
Part of the settings can also be made directly on the device.

Figure 21:   The 'Automatic Calibration' menu in the ECT configurator
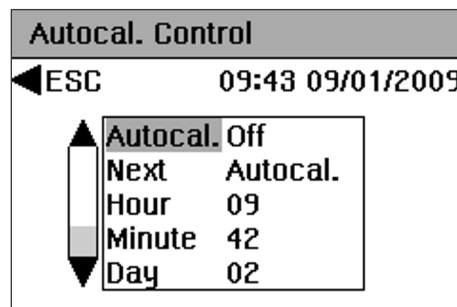
Controlling the automatic calibration

Figure 22:   'Automatic calibration Control' menu

Activation
Automatic calinration is completed only when it is activated.
This 'Open' setting is valid for the cyclically time-controlled start of the automatic calibration; it does not refer to the externally controlled or manual start.

Cycle time
The cycle time must be set in the configurator.
The cycle time shows the time intervals over which automatic adjustment is completed.

Date and time of next automatic calibration
The analyzer system completes the next automatic calibration at the time specified here.
From this moment in time, the cycle period starts to run.

End-point calibration together with zero point calibration
In the configurator, it is necessary to set the cycles in which an end-point calibration is to be performed together with a zero point calibration.

Example:
End-point calibration for each 7th zero-point calibration
With a cycle time of 24 hours, this setting initiates a zero point calibration every day and a end-point calibration once a week.

Note
If the automatic calibration is started manually, a zero point and end-point calibration is always performed; the configured cycle for time-controlled calibration is therefore unaffected.

Output current response
In the configurator, you need to set whether during the calibration process, the signals at the current outputs (analog outputs) are held at the last measured value before the calibration was started or if they follow the measured value changes during calibration.

If the current signals are configured to 'Hold', the limit value monitor is not active during the calibration.

Setting the output current response is effective for both automatic and manual calibration.

Uras26 – Automatic calibration with or without calibration cells
If the Uras26 analyzer is equipped with calibration cells, automatic calibration using calibration cells is enabled by default.

If automatic calibration with calibration cells is deactivated in the configurator for individual sample components and if calibration should be performed with test gases instead, the following must be observed:
- The test gases for the zero point and end point calibration must be switched on via solenoid valves. Control of the solenoid valves via digital outputs must be configured, see **Configuring signal inputs and outputs** on page 74.
- Automatic calibration is performed in the following steps:
  1. The zero point gas is connected in and all sample components are calibrated at the zero point.
  2. The zero point gas remains connected and the sample components with the activated calibration cell are calibrated at the end-point.
  3. The span gases are connected and the sample components with the deactivated calibration cells are calibrated at the end-point.
     In the process, the span gas valves are switched in the sequence specified in the configurator in dialog 'Automatic Calibration' column 'Span Gas Valve' (1 to 5).

Gas feed system

Figure 23: 'Automatic calibration purge times'

Purge times
The purge time settings for each calibration phase determines the time
- after switching from sample gas to zero point gas until the start of zero point calibration,
- after switching from zero point gas to end-point gas or between the end-point gases until the start of end-point calibration, and
- after switching from end-point gas to sample gas until the 'Function check' status signal disappears

so that gas residues do not distort the calibration or the measurement result.

The total purge time for each phase is the sum of each purge time set plus a maximum 4 × the longest set low pass time constant, see **Set low-pass time constant** on page 71.

Note
The purge time should be set to at least three times the T_{90}-time of the **entire** analyzer system.

... 9 Calibration

... Automatic calibration: settings

Calibration method (automatic)

Analyzer	Calibration method	Remark
Uras26	Zero point / end-point calibration	Cannot be changed.
Magnos28	Zero point / end-point calibration or substitute gas calibration or single-point calibration	If a substitute gas component is set up in the Magnos28 analyzer, the calibration method is factory-set to substitute gas calibration, otherwise the zero point / end-point calibration is set. Alternatively, single-point calibration can be selected. See also **Magnos28 – notes for calibration** on page 62.
Caldos27	Single-point calibration	With standard gas this cannot be changed. See also **Caldos27 – Notes for calibration** on page 63.
Caldos25	Zero point / end-point calibration or substitute gas calibration	If a substitute gas component is set up in the Caldos25 analyzer, the calibration method is factory-set to substitute gas calibration, otherwise the zero point / end-point calibration is set (cannot be changed). See also **Caldos25 – notes for calibration** on page 64.

Automatic calibration: manual start

Menu path
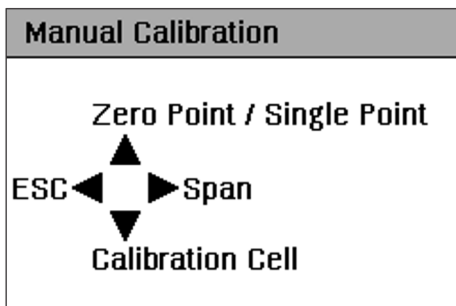
'▲ Operation / ▲ Calibration / ▶ Automatic Calibration'
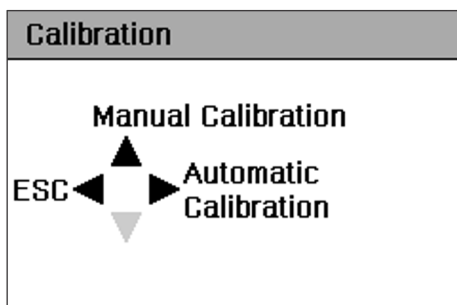
Figure 24: 'Calibration' Menu

Wait until the Warm-up Phase has ended

The analyzer module may not be calibrated until the warm-up phase has ended, see **Duration of the Warm-up Phase** on page 41.

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

Manually starting the automatic calibration
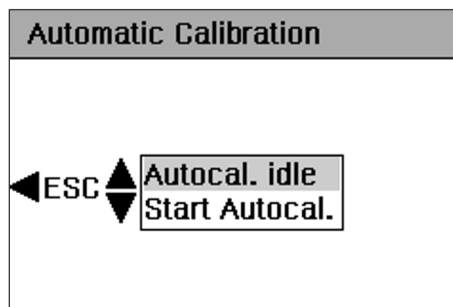
Figure 25: Menu 'Automatic Calibration

Manually aborting the automatic calibration
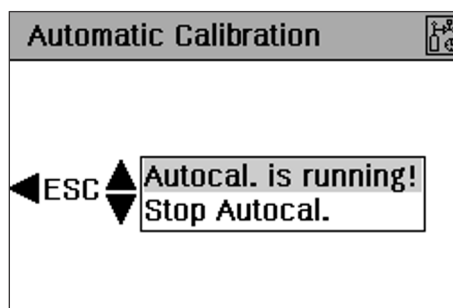
Figure 26: Menu 'Automatic Calibration

Note

When automatic calibration is aborted, the analyzer module is in an undefined state (in reference to the calibration).
For example, the zero point calibration may have been completed and calculated, but the end-point calibration has not yet been carried out. For this reason, automatic calibration will have to be restarted and allowed to run to completion after any cancellation of automatic calibration.

... 9 Calibration

Manual calibration: calibration method

Menu path

'▶ Setup / ▶ Calibration Data / ▼ Manual Cal. Method'
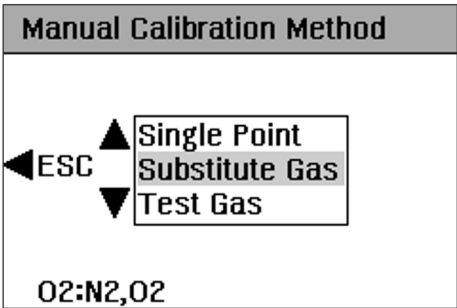
Figure 27:   'Manual calibration method' menu

The calibration method can also be set in the Configurator.

Calibration method (manual)

Analyzer	Calibration method	Remark
Uras26	Zero point / final point calibration (test gas)	Cannot be changed.
Magnos28	Zero point / end-point calibration (test gas) or substitute gas calibration or single-point calibration	If a substitute gas component is set up in the Magnos28 analyzer, the calibration method is factory-set to substitute gas calibration, otherwise the zero point / end-point calibration is set. Alternatively, single-point calibration can be selected. See also **Magnos28 – notes for calibration** on page 62.
Caldos27	Zero point / end-point calibration (test gas) or Single-point calibration	Factory set or with standard gas. See also **Caldos27 – Notes for calibration** on page 63.
Caldos25	Zero point / end-point calibration or substitute gas calibration	Factory set. Can be selected if a substitute gas component is set up in the Caldos25 analyzer. See also **Caldos25 – notes for calibration** on page 64.

Manual calibration: execution

Menu path
‘▲ Operation / ▲ Calibration / ▲ Manual Calibration’

Figure 28: ‘Manual calibration’ menu

Wait until the Warm-up Phase has ended
The analyzer module may not be calibrated until the warm-up phase has ended, see **Duration of the Warm-up Phase** on page 41.

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

Note
- Zero-point calibration must always precede end-point calibration. Zero-point calibration can also be performed on its own.
- Manual calibration cannot be performed while an automatic calibration is in progress.

Manually calibrating measurement components
Zero point / single point calibration
1. Select the ‘Zero Point / Single Point’ menu.
2. Select individual sample components or ‘All’ (according to the configuration in the ‘Manual Calibration’ ECT dialog).
3. Check zero point set point* and set if necessary.
4. Connect zero point gas (if it is not automatically connected).
5. Once the measured value display is stable, start the calibration.
6. Save calibration or repeat calibration**.

End-point calibration
1. Select the ‘Span’ menu.
2. Select the Sample component.
3. Check end point set point* and set if necessary.
4. Connect end-point gas (if it is not automatically connected).
5. Once the measured value display is stable, start the calibration.
6. Save calibration or repeat calibration**.

End-point calibration with calibration cell (optional with Uras26)
1. Select the ‘Calibration Cell’ menu.
2. Select sample component or ‘All’.
3. Connect zero point gas (if it is not automatically connected).
4. Once the measured value display is stable, start the calibration.
5. Save calibration or repeat calibration**.

* The parameterized test gas concentration is displayed. If the setpoint is altered here, the parameterized test gas concentration is overwritten.

** A calibration may have to be repeated if the measured value is stil not stable after initiation of the calibration. The repeated calibration is based on the measured value obtained in the preceding calibration.

... 9 Calibration

Uras26 – Instructions for calibration

Calibration methods
*   Automatic calibration:
    zero point/end-point calibration
*   Manual calibration:
    zero point/end-point calibration

Calibration Cells
The use of calibration cells (option) allows the end-point calibration of the Uras26 without using test gas containers.
A calibration cell is installed in each beam path of the analyzer in accordance with the order. Each calibration cell is filled with a test gas, the composition and concentration of which is adapted to the sample components and measuring ranges, which are set up in the respective beam path.
The calibration cells are retracted into the beam path during the end-point calibration.
Information about the installed calibration cells is included in the device data sheet.

The concentration set points of the test gases in the calibration cells should be checked at large intervals (see **Uras26 – measuring the calibration cell** on page 97) (recommended: once a year).

Manual Calibration
In the 'Manual Calibration' you need to select if each sample component should be calibrated individually or all sample components jointly during the zero point calibration of the Uras26.
You also need to select if the end-point calibration of the Uras26 is done with calibration cells or with test gases.

Calibration of the Uras26 together with Magnos28 or Caldos27 or Caldos25
Automatic Calibration
When performing a zero-point calibration of the Uras26, zero-point calibration of the Caldos25 (see **Magnos28 – notes for calibration** on page 62) or a single-point calibration of the Magnos28 (see **Single-point calibration** on page 62) or the Caldos27 (see **Single-point calibration** on page 63) is performed at the same time. The test gas must be selected accordingly.

Manual Calibration
For the Uras26 (infrared) sample components, the zero point/end-point calibration is fixed as the calibration method. The calibration method for the (non-infrared) measurement component of the Magnos28 or Caldos27 or Caldos25 needs to be configured.
With manual calibration, you can select whether the single-point calibration should be carried out individually or together with the zero-point calibration of the Uras26.

Uras26 calibration with internal cross-sensitivity correction
During the calculation of the calibration, possible electronic cross-sensitivity corrections are switched off by other sample components measured with the Uras26.

The following information should therefore be noted in particular: The following information should therefore be noted in particular:

Zero-point calibration
All the sample components must always be calibrated in the following sequence for the zero point calibration:
*   First the sample component which is not corrected.
*   afterwards the sample component which is affected by the smallest number of corrections.
*   up to the sample component which is affected by the largest number of corrections.

End-point calibration
All the sample components must also always be calibrated in the end-point calibration.
Here, a corrected sample component may only be calibrated using a test gas contain no components which cause cross-sensitivity, i.e. which only consists of the sample component and an inert gas, such as N_2.

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.

... 9 Calibration

Magnos28 – notes for calibration

Calibration methods
- Automatic calibration:
  zero point/end-point calibration or substitute gas calibration (factory-set if the substitute gas component is set up) or single point calibration
- Manual calibration:
  Zero point/end-point calibration or substitute gas calibration (factory-set if the substitute gas component is set up) or single point calibration

Substitute gas calibration
If the test gases for the adjustment are not available, e.g. because they cannot be filled in test gas bottles or because their components are not compatible with one another, the Magnos28 can be set at the factory for calibration with a substitute gas in accordance with the order.

In addition to the measuring range of the sample component, a measuring range for the substitute gas component is then set up at the factory; normally this is O_2 in N_2. This setting is documented in the device data sheet.

Substitute gas calibration is a zero point / end-point calibration of the substitute gas component.
The zero and final points of the measuring ranges of sample components in Magnos28 are then corrected electronically by the values established during this calibration.

Note
- If the analyzer is set to calibration with a substitute gas, the substitute gas calibration must always be carried out in order to calibrate all sample and substitute gas components.
- A zero point/end point calibration either only in the sample components or in the substitute gas measuring ranges results in an erroneous calibration of the analyzer module.

Single-point calibration
The long-term sensitivity drift of the Magnos28 is less than 0.15 % of measured value per three months (at least 0.03 vol. % O_2 per three months).
Therefore, in measuring ranges from 0 to 5 vol.-% to 0 to 100 vol.-% O_2, it is sufficient to perform an offset correction routinely only.

This so-called single-point calibration can be done at any point of the characteristic curve as this causes a parallel shift of the characteristic curve.

It is recommended to additionally perform an end-point calibration at least once a year, depending on the measurement task.

Note
Sensitivity drift can be short-term up to 1 % of the measured value per week.

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.

Caldos27 – Notes for calibration

Calibration methods
- Automatic calibration:
  single-point calibration
- Manual calibration:
  zero point/end point calibration (factory-set) or single point calibration

Single-point calibration
Due to the operating principle of the sensor in the Caldos27 analyzer, the zero point and end point do not drift independently.
Therefore routine calibration of the Caldos27 can be performed as a so-called single-point calibration using standard gas.
This technique leaves out safety- related measurements.
Depending on the measurement task involved, the zero point and end point should be checked periodically (recommendation: once a year).

Standard gas
The 'Standard gas' component is always configured as the last of the maximum five sample components (see **Active Component Selection** on page 72) in Caldos27
Single-point calibration with standard gas affects all other sample components configured in Caldos27.

At the factory, a standard gas N_2 with the measured value 10000 rTC is set.
If another standard gas is used during manual calibration, its rTC set point must be entered as the calibration progresses.

Standard gas	rTC set point
N_2	10000 rTC
Air	10070 rTC
Ar	7200 rTC
CO_2	7500 rTC
CH_4	14000 rTC
He	50000 rTC
H_2	60000 rTC

After the standard gas has been changed, the zero point and end point of the sample components configured in Caldos27 must be checked and recalibrated, if necessary.

Associated gas effect
The Caldos27 analyzer measurement technique is based on the differing thermal conductivity of various gases.
Since this technique is non-selective, the concentration of a sample component can be accurately measured only in a binary or quasi-binary gas mixture.
If other associated gas components are present in the sample gas their effect on initial factory calibration must be considered.

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.

... 9 Calibration

Caldos25 – notes for calibration

Calibration methods
*   Automatic calibration:
    zero point/end-point calibration or substitute gas calibration (factory-set if the substitute gas component is set up, cannot be changed)
*   Manual calibration:
    zero point/end-point calibration (factory set) or substitute gas calibration (can be selected if the substitute gas component is set up)

Substitute gas calibration
If the test gases for the adjustment are not available, e.g. because they cannot be filled in test gas bottles or because their components are not compatible with one another, the Caldos25 can be set at the factory for calibration with a substitute gas in accordance with the order.

In addition to the measuring ranges of the sample components, one or more measuring ranges are then factory set for the substitute gas component. This setting is documented in the Analyzer Data Sheet.

Substitute gas calibration is a zero point / end-point calibration of the substitute gas component. The zero points and end points of the measuring ranges of sample components in Caldos25 are then corrected by the values established during this calibration.

Note
*   If the analyzer is set to calibration with a substitute gas, the substitute gas calibration must always be carried out in order to calibrate all sample and substitute gas components.
*   A zero point/end point calibration either only in the sample components or in the substitute gas measuring ranges results in an erroneous calibration of the analyzer module.

Associated gas effect
The Caldos25 analyzer measurement technique is based on the differing thermal conductivity of various gases.

Since this technique is non-selective, the concentration of a sample component can be accurately measured only in a binary or quasi-binary gas mixture.

If other associated gas components are present in the sample gas their effect on initial factory calibration must be considered.

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.

10 Configuration

Measuring range switchover

Description
The limits of the measuring ranges can be set by following the rules applicable to the respective analyzer:
- Uras26: see **Uras26 – Change measuring range limits** on page 69,
- Magnos28: see **Magnos28 – Change measuring range limits** on page 69,
- Caldos27: see **Caldos27 – Change measuring range limits** on page 70.

Only one measuring range is set up in the Caldos25, the limits of this measuring range cannot be changed.

Limits of measuring ranges
The limits of the measuring ranges can be set by following the rules applicable to the respective analyzer within the physical measuring range:
In addition, the following conditions apply for the combination of measuring ranges.

Two initial measuring ranges
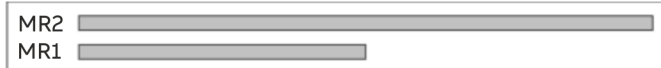
Figure 29:   Two initial measuring ranges

- **Measuring range 2 (MR2):**
  Initial measuring range (≤ physical measuring range)
- **Measuring range 1 (MR1):**
  Initial measuring range (≤ physical measuring range)
- **Condition:**
  Measuring span MR1 ≤ measuring span MR2

One measuring range with suppressed zero point, one initial measuring range

Figure 30:   A measuring range with suppressed zero point, an initial measuring range

- **Measuring range 2 (MR2):**
  Measurement ranges with suppressed zero point
- **Measuring range 1 (MR1):**
  Initial measuring range
- **Condition:**
  End value MR1 > Initial value MR2

Two measurement ranges with suppressed zero point

Figure 31:   Two measuring ranges with suppressed zero point

- **Measuring range 2 (MR2):**
  Measurement ranges with suppressed zero point
- **Measuring range 1 (MR1):**
  Measurement ranges with suppressed zero point
- **Conditions:**
  - Start value MR1 ≤ Start value MR2
  - End value MR1 > Initial value MR2

Note
Other measuring range combinations are not possible.

Measuring range switchover and feedback
There are three ways of executing the measuring range switchover:
- Manually on the gas analyzer,
- Automatic 'Autorange' using correspondingly configured switching thresholds,
- Externally controlled via appropriately configured digital inputs (see **Configuration of inputs and outputs for measuring range switchover and feedback** on page 67).

The measuring range feedback can be implemented via appropriately configured digital outputs (see **Configuration of inputs and outputs for measuring range switchover and feedback** on page 67); it is independent of the selected type of measuring range switchover.

The gas analyzer is factory-set to measuring range 2 and to manual measuring range switchover.

... 10 Configuration

... Measuring range switchover

Measuring range configuration
The measuring ranges can be configured either in the configurator (see **Measuring range configuration with ECT** on page 66) or in the gas analyzer (see **Measuring range configuration in the gas analyzer** on page 68):

Configuration	Configurator	Gas analyzer
Type of measuring range switchover	X	X
Measurement range limits	X	X
Switch-over thresholds for autorange	X	X
Digital inputs/outputs	X	—

Manual measuring range switchover
Menu Path
  '▲ Operation / ▼ Switch-Over / ▼ Active Range'
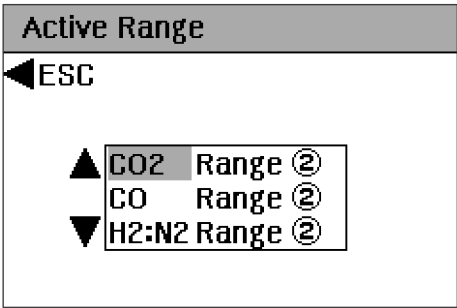
Figure 32: 'Active measuring range' menu

Measuring range configuration with ECT

Measuring range parameters
Measuring range switchover
The type of measuring range switchover 'Range Mode' is configured in the 'Component' components dialog:
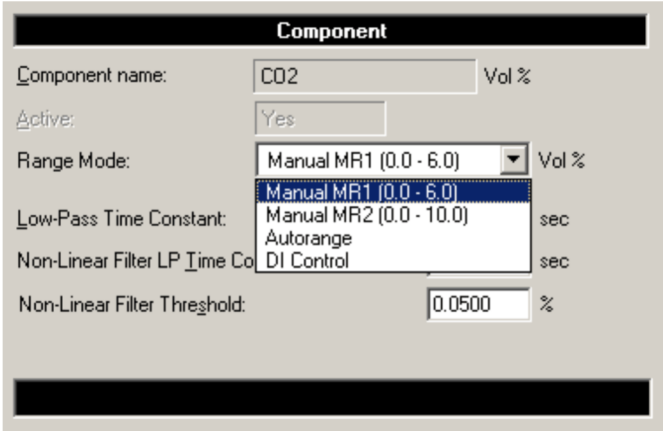
Figure 33: 'Component' menu

Note
The automatic measuring range switchover 'Autorange' can only be configured if an analog output is assigned to the detector. The externally controlled measuring range switchover 'DI Control' can only be configured if an analog output and a digital input are assigned to the detector, see **Figure 35** on page 67.

Measuring range limits and autorange switching thresholds
The lower range values and upper range values as well as the autorange switching thresholds are configured in the 'Measurement Range' measuring range limit dialog:

Figure 34:   'Measurement Range' menu

Note
- The values of the autorange switchover thresholds must both be in the 'Measuring range 2 initial value to measuring range 1 end value' range.
- The value of the autorange switching threshold MR2->MR1 must be less than the value of the switching threshold MR1->MR2.

The conditions for the limits and combinations of the measuring ranges must be observed, see **Limits of measuring ranges** on page 65.

Configuration of inputs and outputs for measuring range switchover and feedback
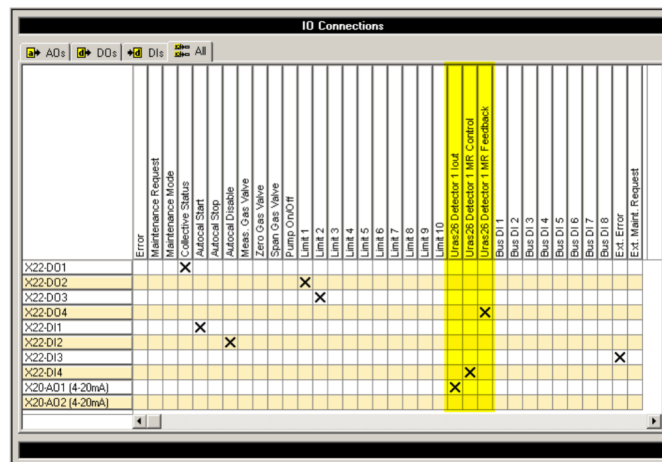
Figure 35:   'IO Connections' menu

In the example shown in the figure, the following inputs and outputs are assigned to the Uras26 detector 1 (see yellow marking):
- the X20-AO1 analog output for the measured value output ('Iout'),
- the X22-DI4 digital input for external control of the measuring range switchover ('MR Control'),
- The X22-DO4 digital output for the measuring range feedback ("MR Feedback").

Functionality of digital inputs and outputs for measuring range switchover and feedback

Active measuring range	Switching state*	Digital input**	Digital output**
Measuring range 1	0	open	Relays de-energized
Measuring range 2	1	closed	Relays energized

*   Inputs and outputs are not inverted

** For possible wiring of the inputs and outputs see **Terminal assignment** on page 30

... 10 Configuration

Measuring range configuration in the gas analyzer

Menu Path
'▶ Setup / ▲ Measurement Ranges'

The measuring range parameters must be set individually for each sample component.

Measuring range parameters

Figure 36: 'Measuring range' menu

Measuring range switchover mode
- Manual
- Automatic (Autorange)
- Externally controlled (DI control)

Measurement range limits
- Measuring range 1 initial value
- Measuring range 1 final value
- Measuring range 2 initial value
- Measuring range 2 final value

Autorange switchover thresholds
- Switchover from measuring range 1 to measuring range 2
- Switchover from measuring range 2 to measuring range 1

Note
- The automatic measuring range switchover ('Autorange') can only be configured if an analog output is assigned to the detector.
- The externally controlled measuring range switchover ('DI Control') can only be configured if an analog output and a digital input are assigned to the detector, see **Figure 35** on page 67.
- The values of the autorange switchover thresholds must both be in the 'Measuring range 2 initial value to measuring range 1 end value' range.
- The value of the autorange switching threshold MR2->MR1 must be less than the value of the switching threshold MR1->MR2.

The conditions for the limits and combinations of the measuring ranges must be observed, see **Limits of measuring ranges** on page 65.

Manual measuring range switchover
Menu Path
'▲ Operation / ▼ Switch-Over / ▼ Active Range'

Figure 37: 'Active measuring range' menu

Uras26 – Change measuring range limits

Menu Path

'▶ Setup / ▲ Measurement Ranges'

The measuring range limits can also be set in the Configurator, see **Measuring range configuration with ECT** on page 66.

Note
- Measuring ranges may not be specified within ignition limits.
- After changing the measuring range limits, the calibration of the relevant measuring range needs to be checked.

Measurement range limits
- The **lower range value** cannot be changed.
- The **upper range value** must be within the physical measuring range.

Adjustment range
The measuring range can be freely set within the limits of the physical measuring range (see table).

Physical measuring range
The analyzer has one physical measurement range per sample component. The standard measuring ranges are:

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

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

Calibration Cells
If the analyzer is equipped with calibration cells, the set points for each measured component are about 80 % of the physical measuring range or 80 % of the measuring range set according to the order.

Magnos28 – Change measuring range limits

Menu Path

'▶ Setup / ▲ Measurement Ranges'

The measuring range limits can also be set in the Configurator, see **Measuring range configuration with ECT** on page 66.

Note
- Measuring ranges may not be specified within ignition limits.
- After changing the measuring range limits, the calibration of the relevant measuring range needs to be checked.

Measurement range limits
The **lower range value** and the **upper range value** must be within the physical range.

Adjustment range
The measuring range can be freely set within the limits of the physical measuring range.
- The measuring range set at the factory can be found on the name plate or device data sheet.
- The minimum measuring range is 0 to 0.5 Vol.- % O_2.

Physical measuring range
The analyzer has a physical measuring range.
The limits of this measuring range are 0 Vol.-% O_2 or 100 Vol.-% O_2.

... 10 Configuration

Caldos27 – Change measuring range limits

Menu Path
 '▶ Setup / ▲ Measurement Ranges'

The measuring range limits can also be set in the Configurator, see **Measuring range configuration with ECT** on page 66.

Note
- Measuring ranges may not be specified within ignition limits.
- After changing the measuring range limits, the calibration of the relevant measuring range needs to be checked.

Measurement range limits
The **lower range value** and the **upper range value** must be within the physical range.

Setting range
The measuring range can be freely set within the valid limits for the measured component.
- For the 'relative thermal conductivity' component set at the factory, the measuring range is fixed to rTC = 0 to 64.000..
- The widest measuring range is 0 to 100 vol.-% or 0 vol.-% until saturation, depending on the measurement task.

Physical measuring range
Each analyzer has one physical measuring range for each sample component. The limits of this measuring range are usually 0 vol.-% or 100 vol.-%.

Limit values

Setup

Figure 38: Menu 'Limit'

The limit values can only be set in the configurator and not in the gas analyzer.

Parameters

Parameter	Description
Limit Name (Limit value name)	The name of the limit value.
☑ **Limit Active** (☑ Limit value active)	Limit value monitoring can be activated or deactivated.
Assigned Component (Assigned sample component)	Selection of all measured components present in the gas analyzer.
Limit Value (Limit value)	Value range: within the physical measuring range of the analyzer.
Direction (Direction of action)	The alarm signal is given when the measured value is larger or smaller than the set limit value.
Hysteresis (Hysteresis)	Value range: within the physical measuring range of the analyzer.
Delay Time (Delay time)	Waiting time after the limit value event (come or go) has occurred until the output is updated. Value range 0 to 60.000 ms.
☑ **Confirmation required** (☑ Acknowledgment required)	If a limit value is up-scaled, the output signal is not reset until the limit value has been down-scaled again **and** the user has acknowledged the status message.

Note
If several measured components are configured in the gas
analyzer and these measured components are assigned limit
values, the status of the inactive measured components is set to
'normal' upon changing the active measured component and the
active measured component is monitored.

Standard configuration
As a rule, limit value monitoring for those measured components
to be measured by the gas analyzer is factory-set.
This requires that there be a sufficient number of digital outputs
on the digital I/O modules to handle the number of sample
components, see **Terminal assignment** on page 30.

Set low-pass time constant

Setup

Figure 39:   Menu 'Component'

The low pass time constants can only be set in the configurator
and not in the gas analyzer.

Parameters
A non-linear filter with 2 low-pass time constants and a
switching threshold can be configured for each measured
component.

Parameter	Description
Low-Pass Time Constant (Low-pass time constant)	Value range: 0 to 60 s
Non-Linear LP Time Constant (Low pass time constant for non-linear filter)	Value range: 0 to 60 s
Non-Linear Filter Threshold (Switching threshold for non-linear filter)	Value range: 0 to 9.99 % of the measuring span of the physical measuring range. If the switching threshold is up-scaled during a measured value change, the low pass time constant for non-linear filters takes effect.

... 10 Configuration

Active Component Selection

Menu Path

'▲ Operation / ▼ Switch-Over / ▶ Active Component'
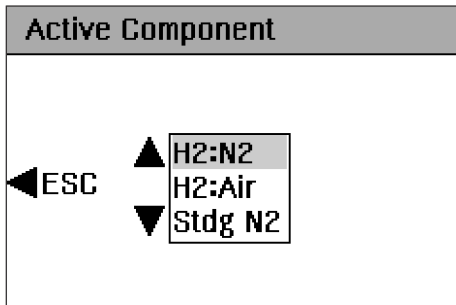
Figure 40: 'Active Component' Menu

Active Component

The 'Active Component' parameter appears in the Magnos28, Caldos25 and Caldos27 analyzer.

Several sample components can be calibrated for these analyzers. However, there is always only one component measured and displayed.

Magnos28 and Caldos25

For Magnos28 and Caldos25, the measured components are factory-configured. In the 'Active Component' menu, select a measured component to be measured and displayed.

Caldos27

Selection of the active measured component is done in two steps:

1. In the configurator, up to four sample components can be selected from the context menu of the Caldos27 detector, which are then loaded into the gas analyzer.
    The factory-configured 'Standard Gas' component cannot be deleted. It is also not possible to delete a 'user component' which was factory-configured in the analyzer.
2. In the 'Active Component' menu of the gas analyzer, select a sample component to be measured and displayed from the maximum five sample components.

Calibration

All measured components are pre-calibrated at the factory. After the initial activation of a sample component, zero point and end point must be checked and recalibrated if necessary.

Externally controlled measured component switch

Description

The externally controlled switch of the active sample component is possible via appropriately configured digital inputs (see **Terminal assignment** on page 30). Appropriately configured digital outputs are required for the sample component feedback.

Functionality

The sample component is activated via a signal at the digital input assigned to the sample component switchover. The correspondingly configured digital output is set for the feedback of the active sample component.

If there is no signal at any of the configured digital inputs upon restart of the gas analyzer, the last sample component stored as active becomes active again.

Configuration using ECT
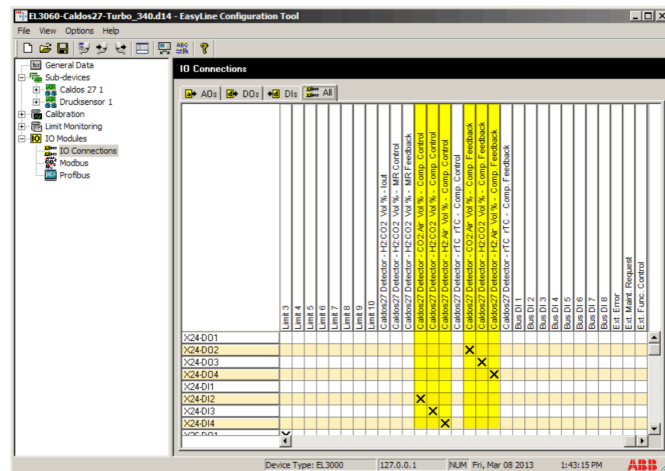
Figure 41: Menu 'IO Connections'

In the example shown in the figure, the following digital inputs and outputs are assigned to the Caldos27 detector (see yellow marking):

*   Digital inputs X24-DI2 to X24-DI4 for external control of the sample component switchover ('Comp. Control') and
*   The digital outputs X24-DO2 to X24-DO4 for the sample component feedback ('Comp. Feedback').

Changing the physical unit for a sample component

Configuration

The physical unit used for the measured value display of a sample component, e.g. ppm or mg/m^3, can be changed 'Configurator'.

- One of the units defined at the factory can be selected for system components.
- For user components, the choice of units depends on which of the parameters required for the calculation have been entered during configuration of the components.

The unit for a component can be changed for the following analyzers:

Analyzer	Physical units
Uras26	ppm, vol%, mg/m^3, g/m^3
Magnos28	ppm, vol.%

Procedure

1. In ECT, register the communication with the gas analyzer and transfer the configuration data from the gas analyzer to the computer.
2. In the tree structure, left-click the sample component for which the physical unit needs to be changed.
3. Select the desired physical unit in the 'Component' dialog for the 'Component Name:' parameter.
4. Transfer the configuration data from the computer to the gas analyzer.

Caldos27 – configure and calibrate sample components

Configuring new sample components

In the configurator, up to four sample components can be selected from the context menu of the Caldos27 detector, which are then loaded into the gas analyzer.

If necessary, an already configured sample component must be deleted. The factory-configured 'standard gas' component cannot be deleted. It is also not possible to delete a 'user component' which was factory-configured in the analyzer.

Note

When a sample component is deleted, the calibration data for this sample component is lost. We therefore recommend that you make a backup copy of the device data set using the ECT software tool before deleting a sample component.

In the 'Active components' menu of the gas analyzer, select a sample component to be measured and displayed from the maximum five sample components.

Calibrating the new sample component

All available sample components are pre-calibrated at the factory.
After the initial activation of a sample component configured by the user, zero point and end point must be checked and recalibrated if necessary.

Note

The sample components configured in accordance with the order are fully calibrated at the factory.

… 10 Configuration

Configuring signal inputs and outputs

Setup
The signal inputs and outputs (I/O connections) can only be configured in the Configurator and not on the gas analyzer.

Function
Assignments for the following are configured
*   the analog outputs (AOs),
*   the digital outputs (DOs) and
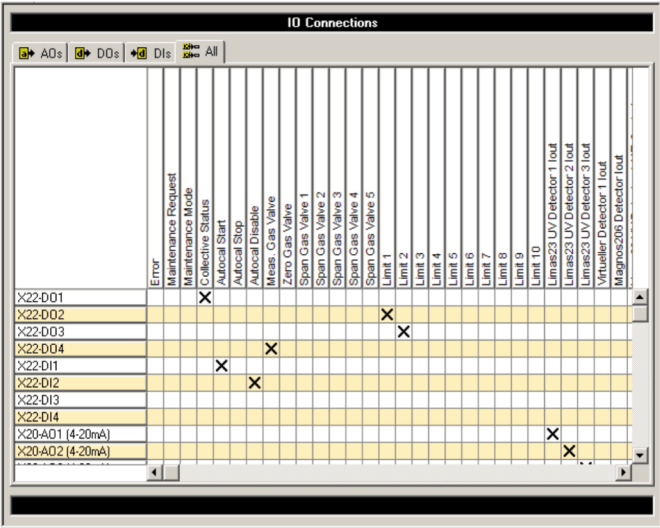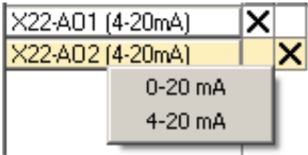*   the digital inputs (DIs).

Assignment

Figure 42:   'I/O Connections' menu

Only one function can be assigned to each signal input or output. A function can be assigned to several signal inputs or outputs. Multiple external status signals can be configured depending on the number of free digital inputs.

Analog outputs
By default, the measured values are assigned to the analog outputs AO1, AO2, etc. in the order of configuration, see **Terminal assignment** on page 30.

Right-clicking on the name of the analog output opens a context menu where you can switch between '0–20 mA' and '4–20 mA':

Digital outputs, digital inputs
The default configuration of the digital outputs and inputs is shown in **Standard assignment of digital inputs and digital outputs** on page 31.

Right-clicking on the name of the digital output- or input -opens a context menu where you can switch between 'No Invert' and 'Invert':
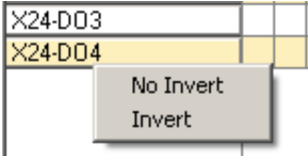
Setting the IP address

Menu Path
„▶ Setup / ▼ Device Settings / ▶ Ethernet"
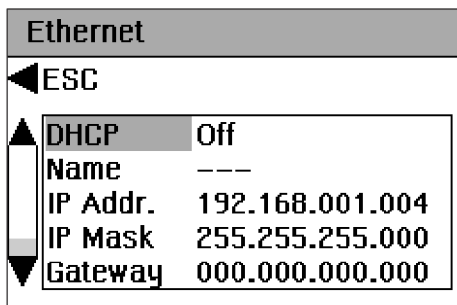
Illustration43: 'Ethernet'' Menu

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.

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.

... 10 Configuration

Setting the date and time

Menu Path

'▶ Setup / ▼ Device settings / ▼ Date/time'
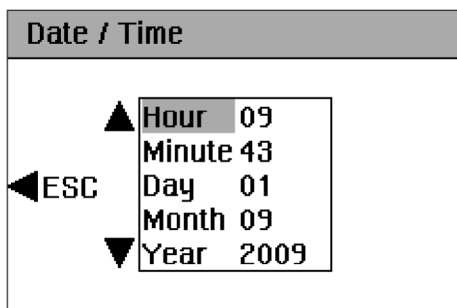
Figure 44:   'Date/Time' menu

Selecting the user interface language

Menu Path

'▶ Setup / ▼ Device Settings / ▲ Language'
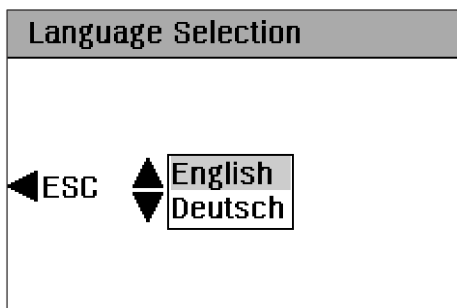
Figure 45:   'Language selection' menu

Language Selection

The gas analyzer has two user interface languages available which can be switched as needed.

The factory-set language is English; the second language can be configured using the ECT software tool ECT (see **Configuring the user interface language** on page 76).

Configuring the user interface language

Downloading the language file to the gas analyzer
Requirements:

The ECT software tool ('Configurator') is installed on the computer, and the current language files are saved in the 'C:\Program Files (x86)\Analyze IT\ECT\Languages' folder.

1. Open the ECT software tool.
2. In the 'Options' menu, either click on the 'Communication Properties…' command or select the icon on the toolbar.
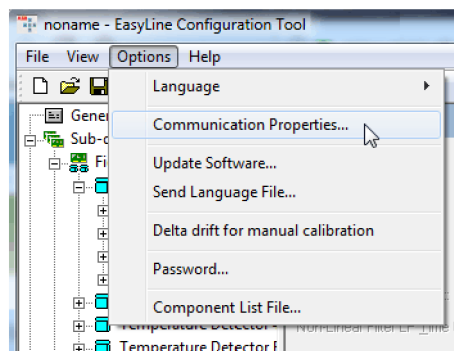

3. In the 'Communication Properties' dialog, enter either the network name (server name) or the IP address of the gas analyzer.
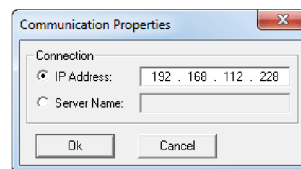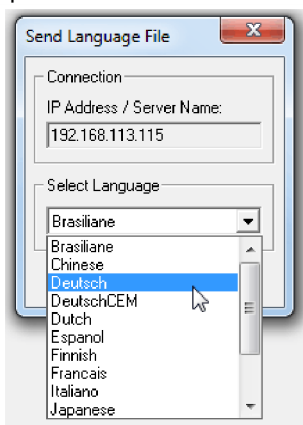

4. Close the dialog by clicking 'Ok'.
5. In the 'File' menu, either click on the 'Receive Data' command or select the icon on the toolbar.
    The configuration data is transferred from the gas analyzer to the computer.
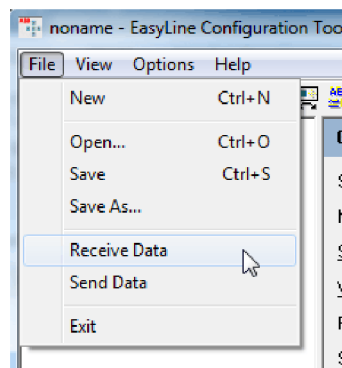
6. In the 'Options' menu, either click on the 'Send Language
    File…' command or select the ![ABC icon] icon on the toolbar.
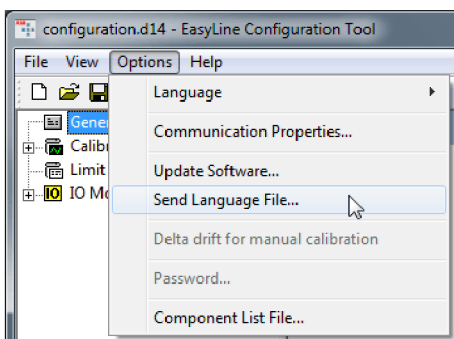
7. In the 'Send Language File' dialog under 'Select Language',
    click on the drop-down field and select the desired language.

8. Close the dialog by clicking 'Ok'.
    The selected language is transferred from the computer to
    the gas analyzer.

Password

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).

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.

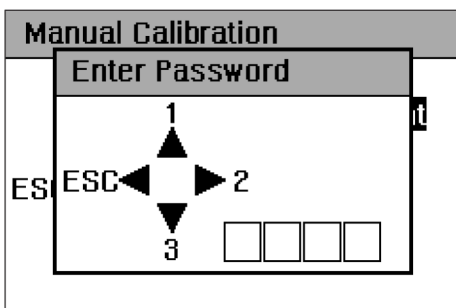# ... 10 Configuration

... Password

Enter password

Figure 46: 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, see **Time out function** on page 44.

Software updates

Software updates

With the software update, the current data set is transmitted from the gas analyzer to the computer and, together with the new software, it is reloaded to the gas analyzer. Additional changes to the configuration of the gas analyzer using the ECT software tool must be performed in a separate step.

Perform software update

1. Open the ECT software tool.
2. In the 'Options' menu, either click on the 'Communication Properties…' command or select the ⌨ icon on the toolbar.
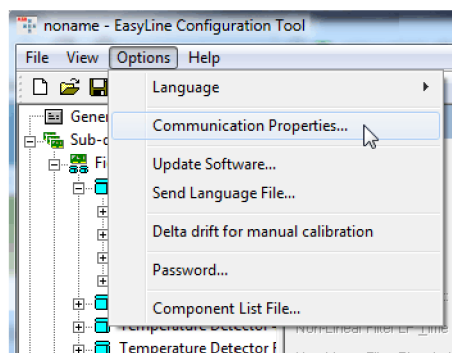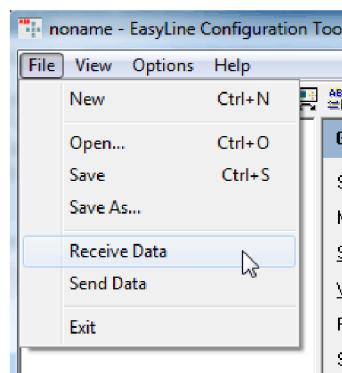

3. In the 'Communication Properties' dialog, enter either the network name (server name) or the IP address of the gas analyzer.
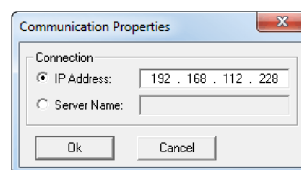

4. Close the dialog by clicking 'Ok'.
5. In the 'File' menu, either click on the 'Receive Data' command or select the ⌨ icon on the toolbar.
   The configuration data is transferred from the gas analyzer to the computer.
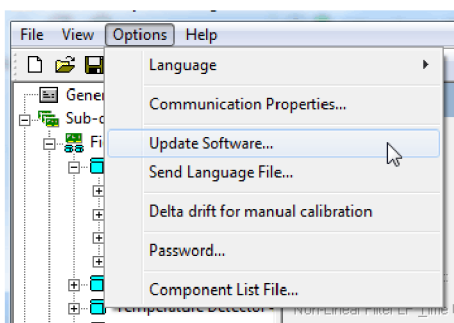
6. We recommend making a backup of the configuration data before loading the software update:
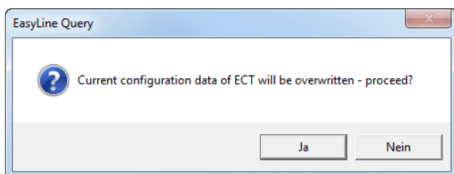In the 'File' menu, click on the 'Save' or 'Save as…' command or select the 🖫 icon on the toolbar and save the configuration data under a suited file name.
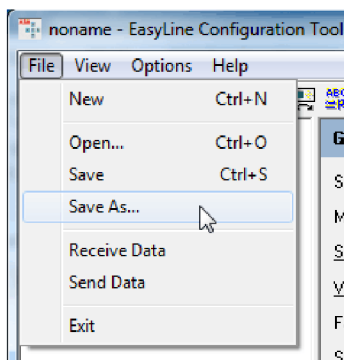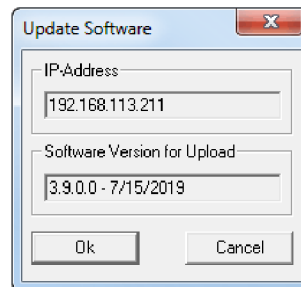
7. In the 'Options' menu, either click on the 'Update Software…' command or select the 🖳 icon on the toolbar.

8. Confirm the question 'Configuration will be overwritten – continue?' by clicking 'Yes'.

9. The address of the gas analyzer set in Step 3 and the software version to be transmitted are displayed in the 'Update Software' dialog. Close the dialog by clicking 'Ok'.

10. Confirm the update of software in the 'EasyLine Query' dialog by clicking 'Ok'.
The new software is loaded onto the gas analyzer.
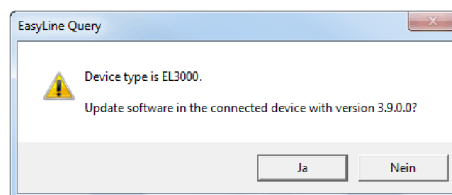
11. After the update has been completed, the information 'New software successfully installed. Wait for the gas analyzer to restart. After the restart, a new language can be loaded onto the gas analyzer' appears.
Close the window by clicking 'Ok'.
The gas analyzer has been restarted ('Booting').

Note
The software update and restart of the gas analyzer can take several minutes

11 QAL3 monitoring

General information

Application

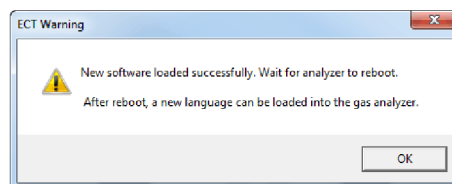The QAL3 monitoring is used to continuously monitor the quality of the measurement results of an automatic measuring system (AMS) during normal operation.

The requirements for the various methods of quality assurance are described in the European standard for quality assurance EN 14181:2004 "Emissions from stationary sources – quality assurance for automatic measuring systems.

The quality assurance level QAL3 defined in this standard concerns the control of the AMS during operation; it forms the basis for the functional scope of QAL3 monitoring.

Description

QAL3 monitoring is integrated into the gas analyzer as an option on a memory card.
QAL3 monitoring features the following functions:
- Automatic acquisition, verification and documentation of drift and precision at zero point and reference point.
- Reporting via CUSUM and Shewhart control charts (see **Control cards** on page 81).
- Storage of QAL3 data in the gas analyzer (approx. 1 year)
- Display and query of QAL3 data as well as configuration (see **Configuration of QAL3 monitoring** on page 82) using a web browser.
- Status messages in the case of deviations beyond requirements
- Data export for further processing, for example in a spreadsheet program.

Requirements

The prerequisites for the operation of QAL3 monitoring are:
- The gas analyzer must be connected to a PC via the Ethernet interface.
- The current version of a web browser must be installed on the PC.
- In the web browser you must have Cookies and JavaScript enabled.
- The memory card with the 'QAL3 monitoring' option must be installed in the gas analyzer.

Is the 'QAL3 monitoring' option integrated in the gas analyzer?

Do the following to determine whether the 'QAL3 monitoring' option is integrated in the gas analyzer:
- 'Option QAL3:OK' is displayed in the '▼ Maintenance / ▼ Diagnosis / ▶ Device info' menu

- The memory card with the 'QAL3 monitoring' option is located in a bracket on the AMC board (behind the front panel).

Control cards

CUSUM Control Cards

CUSUM control cards allow the isolated determination of accuracy and drift of the AMS at the zero point and reference point.

Parameters to determine the precision

hs	hs = 6.90 s^2_{AMS}	Test value to detect loss of precision
ks	ks = 1.85 s^2_{AMS}	Constant used to calculate the preliminary total for standard deviation
dt		Difference between the current device display of the AMS and the reference value (observe the sign)
sp		Preliminary normalized sum of AMS standard deviations
st		Preliminary normalized sum of the AMS standard deviations at time t
N(s)t		Number of device displays since the occurrence of a standard deviation different than zero

Parameters to determine drift

hx	hx = 2.85 s_{AMS}	Test value to detect drift
kx	kx = 0.501 s_{AMS}	Constant for calculating the total amount of positive and negative differences and calculating the correction needed for the AMS
dt		Difference between the current device display of the AMS and the reference value (observe the sign)
Sum(pos)p		Preliminary normalized total of the AMS positive drift
Sum(pos)t		Normalized total of the positive drift of the AMS at time t
N(pos)t		Number of device displays since a positive deviation occurred
Sum(neg)p		Preliminary normalized total of the negative drift of the AMS
Sum(neg)t		Normalized total of the negative drift of the AMS at time t
N(neg)t		Number of device displays since a negative deviation occurred

Test for acceptance of the precision ('Decrease of Precision')

st less than or equal to **hs** for both zero point and end point	AMS is working in the control area, carry out drift testing
st greater than **hs** for zero point or end point	Determine the cause of the failure, notify the manufacturer in case of device defects (drift check not necessary)

Drift check

Sum(pos)t less than or equal to **hx** and **Sum(neg)t** less than or equal to **hx** for both the zero point and the end point	AMS is working in the control area
Sum(pos)t greater than **hx** or **sum(neg)t** larger than **hx** for zero point or end point	Measured value is out of the control range ('Out of Control'), perform re-alignment of the AMS

Shewhart Control Cards

Shewhart control cards are used to determine the combined accuracy and drift of the AMS.
The differences dt between the measured values and the set values at the zero point and reference point are determined. These differences must be less than or equal to standard deviations s_{AMS} multiplied by extension factor 2.
If the difference for a measured value is greater, the measured value is marked with a status 'Out of Control' (outside the control range).

… 11 QAL3 monitoring

Configuration of QAL3 monitoring

<div style="background:blue">

NOTICE

</div>

Data loss of the QAL3 data!
The QAL3 data stored on the memory card will be lost if the gas analyzer configuration is changed using the ECT or Optima TCT Light software tools, or if the memory card is mounted in another gas analyzer.
- In these cases the QAL3 data must be exported first (see **Exporting or deleting QAL3 data** on page 84).

Note
- By default set at the factory, QAL3 monitoring is disabled for all measured components, i.e. no QAL3 data is stored.
- If a password (see **Password** on page 77) is configured in the gas analyzer, this password must also be entered when configuring the QAL3 monitoring.

Opening the QAL3 monitoring web interface
1. Make sure that the gas analyzer is connected to a PC via the Ethernet interface.
2. Open the web browser on the PC, enter the IP address of the gas analyzer (if necessary, contact the network administrator) and establish the connection.
   The web interface of the QAL3 monitoring of EasyLine EL3060 is open.

Configuration of sample components
1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. On the 'QAL3 Monitoring' page, click 'Components' (sample components).
3. On the 'Components' page, click on the sample component to configure.
4. On the 'Edit Component' page (edit sample components), enter the following information and values:
   - 'Active' (QAL3 monitoring of the sample component enabled),
   - 'Installation' (installation location),
   - 'Technician' (technician),
   - 'Comment' (comment),
   - 'sAMS Zero' (s_{AMS}-value for zero point),
   - 'sAMS Span' (s_{AMS}-value for reference point).
5. Leave the page by clicking 'Save' (save) or 'Cancel' (cancel).

Configuration of pressure output
1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. On the 'QAL3 Monitoring' page, click on 'Settings' (settings).
3. In the 'Printing' window (print output), check and if necessary change the number of lines on the first page ('Number of lines on first page' – recommendation for high format: 35) and on the following pages, ('Number of lines on all other pages' – recommendation for high format: 50).
4. Leave the page by clicking 'Save' (save) or 'Cancel' (cancel).

Configuration of data storage

1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. On the 'QAL3 Monitoring' page, click on 'Settings' (settings).
3. The following data is displayed in the 'Data storage' (save data) window:
   • 'Current number of data entries' (current number of data sets, additionally in percent of the maximum number),
   • 'Maximum number of data entries' (maximum number of data sets, sufficient for at least 'n' calibrations of all sample components).
     Note
     'n' is calculated and displayed by the system on the basis of the components that are set up in the analyzer and activated for QAL3 (see **Caldos27 – configure and calibrate sample components** on page 73).
4. Check the value for 'Display warning when percentage reached is' (display warning when the percentage value set here is reached) and change if necessary.
5. Leave the page by clicking 'Save' (save) or 'Cancel' (cancel).

Note
The configuration changes are stored in a memory secured against power outages if the user does not enter anything for more than a minute or if the user stops the configuration by clicking on 'Logout'.

Display and print control chart

Display control chart

1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. Select the type of display on the 'QAL3 Monitoring' page:
   • 'Zero point simple' (simple zero point),
   • 'Reference point simple' (simple reference point),
   • 'Zero point details' (detailed zero point),
   • 'Reference point details' (detailed reference point).
3. Select the type of control chart (see '**Control cards** on page 81') ('Control Chart to Display') for the desired sample component.
4. The QAL3 values are displayed chronologically sorted in ascending order.
5. If necessary, at the end of the page, change the number of rows to be displayed per page in the 'Display n lines per page.' field.

Print control chart

1. At the bottom of the 'QAL3 Monitoring' page click on 'Print list'.
2. The listing is displayed in a new window in the web browser.
3. Recommendation: To print the detailed control boards, select the 'Querformat' page orientation.
4. Print the displayed list using the print function of the web browser.
5. The QAL3 values are printed chronologically sorted in ascending order.

… 11 QAL3 monitoring

Edit or delete QAL3 values

Edit a single QAL3 value
1. On the 'QAL3 Monitoring' page in the display of the control chart (see **Display and print control chart** on page 83), click on the number of the QAL3 value (column 'No.') that needs to be edited.
2. The following information and values can be changed on the 'Edit Data' page:
   • 'Technician' (technician),
   • 'Comment' (comment),
   • 'sAMS' (s_{AMS}-value for zero point or reference point).
3. Leave the page by clicking 'Save' (save) or 'Cancel' (cancel).

Deleting a single QAL3 value
1. On the 'QAL3 Monitoring' page in the display of the control chart (see **Display and print control chart** on page 83), click on the number of the QAL3 value (column 'No.') that needs to be deleted.
2. On the 'Edit Data' page, click on 'Delete' (delete).
3. Confirm the following question (Do you really want to delete this value?) by clicking on 'OK'.
4. The value is deleted and the control chart is displayed again.

Exporting or deleting QAL3 data

Exporting QAL3 data
The QAL3 data can be exported from the gas analyzer to archive it or to for example edit it in a spreadsheet program.
1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. Select the type of display on the 'QAL3 Monitoring' page:
   • 'Zero point simple' (simple zero point),
   • 'Reference point simple' (simple reference point),
   • 'Zero point details' (detailed zero point),
   • 'Reference point details' (detailed reference point).
3. Select the type of control chart (see '**Control cards** on page 81') ('Control Chart to Display') for the desired sample component.
4. At the bottom of the page, click on 'Export data' (Export data).
   The QAL3 data from the displayed control chart is exported to a text file (.txt).
5. Open the text file or save it under a new name as needed.
6. If necessary, repeat steps 2 to 5 for additional control charts.

Deleting QAL3 data
1. In the QAL3 monitoring web interface, click 'QAL3 Monitoring'.
2. On the 'QAL3 Monitoring' page, click on 'Settings' (settings).
3. In the 'Data storage' window (save data), click on 'Delete all data' (Delete all data).
4. A warning appears:
   'Do you really want to delete all the data? This operation cannot be undone.
   Make sure all data has been exported before proceeding.'
5. Click on 'OK'. The QAL3 data is deleted.
6. Leave the page by clicking 'Save' (save) or 'Cancel' (cancel).

12 Diagnosis / Troubleshooting

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.

> ### ⚠ WARNING
> **Risk of injury**
> Risk of injury due to improperly performed error correction. The remedial measures described in this chapter require special knowledge and may require work to be done on the gas analyzer while it is open and under voltage!
> - Work on the gas analyzer may only be performed by qualified and specially trained personnel!
> - Only if absolutely necessary should work be performed on an open, energized gas analyzer.

The Dynamic QR Code

Application
Dynamic QR Code is a unique feature for displaying dynamically generated QR codes on the gas analyzer display.
The QR code displayed contains static system information as well as dynamically generated information regarding system configuration and the status of the gas analyzer.

Static data for the identification of the device includes, for example:
- Manufacturing number
- Production date
- Software version
- Serial numbers of the analyzer modules and assemblies that have been installed

Dynamic data for diagnostic purposes in the case of a fault include, for example:
- Status Messages
- Measured values
- Temperature, pressure and flow-rate values
- Drift values
- Analyzer-specific values

In combination with mobile devices (smartphone, tablet, etc.), Dynamic QR Code represents an innovative communication path for the user, enabling improved, case-specific assistance from the ABB service team.

This helps to shorten response times in the event of a fault, thereby increasing the availability of your gas analyzers.

Dynamic QR Code is compatible with both the ABB app "my Installed Base" and standard QR Code scanner apps

... 12 Diagnosis / Troubleshooting

... The Dynamic QR Code

Handling
The QR code is accessed in the Diagnostic Menu of the gas analyzer and indicated on the display.

The QR Code Scanner App installed in the mobile device scans the QR Code that is displayed. The text information that is then displayed on the mobile device is sent to the local service contact specified in the "Measurement Care" contract, by email or other means of transmission.

Alternatively, it is possible to take a photograph of the displayed QR code and send the photograph to the service contact.

Dynamic QR Code Accessing
Menu Path
> '▼ Maintenance / ▼ Diagnosis / ▼ Device Status / ▲ Display QR-Code'

Procedure
1. Select system overview or the required analyzer module.
2. Access the QR code by pressing **OK**.
3. If necessary, change the resolution of the QR code with ▶.
4. Scan QR code.
5. Return to the menu selection by clicking on ◀.

Recommended QR code scanner apps
ABB recommends using the following QR code scanner apps (available free of charge for iOS and Android devices):

"my Installed Base" from ABB

iOS App Store	Google Play

"QR Scanner" from Kaspersky

iOS App Store	Google Play

Status messages – Explanations

Status Signals
The status messages (see **Possible status messages** on page 89) set the 'Failure', 'Maintenance required', 'Function control' as well as 'Total status' status signals.

The assignment of the status signals to the digital outputs can be configured (see **Configuring signal inputs and outputs** on page 74).

Status message	Description
Failure	The analyzer is in a state that requires immediate user intervention. The measured value is invalid.
Maintenance required	The analyzer is in a state that will soon require user intervention. The measured value is valid.
Check function	A calibration is performed on the gas analyzer or the maintenance switch is on. The measured value is not a process measured value and is to be discarded.
Overall status	The overall status is always set together with the 'Failure' status, as well as for individual messages, together with the 'Maintenance required' status, and is not set together with the 'Function check' status.

Status Icons

Icon	Description
	An automatic calibration (page 53) is in progress. The icon also appears in menu mode in the menu title line (page 43).
	A status message (page 89) is active.
	The status signal (page 86) 'Maintenance required' is active. The icon also appears in menu mode in the menu title line (page 43).
	The status signal 'Failure' is active (page 86) or the maintenance switch (page 96) is set to 'On'. The icon is flashing. The icon also appears in menu mode in the menu title line (page 43).
	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!

Status Message Categories

In terms of operator reaction, there are three categories of status messages:

- Status messages not requiring acknowledgment,
- Status messages requiring acknowledgment,
- Status messages requiring acknowledgment and troubleshooting.

Category	Description
Status Messages Not Requiring Acknowledgement	The device operates normally after the status has been cleared. When the status is cleared, the status signal is reset and the status message disappears. **Example:** Temperature error during the warm-up phase.
Status Messages Requiring Acknowledgment	The instrument operates normally after the status has been cleared; however, the operator must be informed of the status. When the status is cleared, the status signal is reset. The status message disappears as soon as the operator has acknowledged it. The operator is thus informed about the malfunction of the instrument. **Example:** No new measured values from the analog/digital converter.
Status Messages Requiring Acknowledgment and Intervention	The device may not operate normally after the status has been cleared; the operator must therefore acknowledge the status and eliminate the cause of the status message. The status signal is reset and the status message disappears as soon as the operator has acknowledged it, and the cause of the status message has been eliminated. **Example:** The offset drift between two calibrations exceeds the permissible range.

Presentation of the categories

In the status message list and the detailed view of the individual status messages, the categories are displayed by the following icons:

Symbol	Status Messages Requiring Acknowledgment	Status Messages Not Requiring Acknowledgement
☐	The status message is not acknowledged.	The status message has occurred (detailed view).
☑	The status message is acknowledged.	—
⬚	—	The status message has expired (detailed view). The status message is inactive (message list).

Acknowledging status messages

Status messages subject to acknowledgment must be acknowledged by selecting **'OK'**.
This can be done in the message list as well as in the detailed view.

... 12 Diagnosis / Troubleshooting

Status messages on the LCD display

Menu path
„▼ Maintenance / ▼ Diagnosis / ▼ Device Status / ▼ Status Messages"
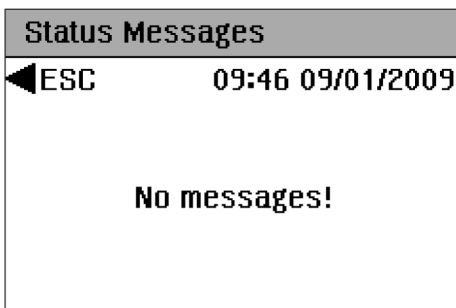
Figure 47:   Menu 'Status Messages'

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

Message list and detailed view
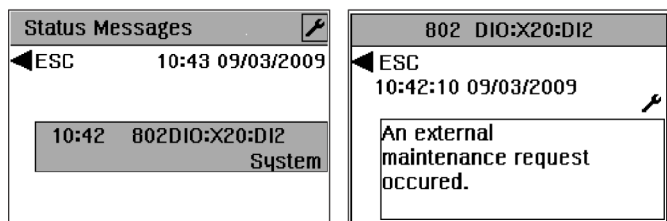
Figure 48:   List of status messages and detailed view

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.

Possible status messages

Legend for the 'status messages' table

| Status Signals		
A	'Failure' status	The analyzer is in a state that requires immediate user intervention. The measured value is invalid.
W	'Maintenance required' status	The analyzer is in a state that will soon require user intervention. The measured value is valid.
F	'Function check' status	A calibration is performed on the gas analyzer or the maintenance switch is on. The measured value is not a process measured value and is to be discarded.
S	Overall status	The overall status is always set together with the 'Failure' status, as well as for individual messages, together with the 'Maintenance required' status, and is not set together with the 'Function check' status.
Status Message Categories		
a	active, status message not requiring acknowledgment	
aQ	active, status message requiring acknowledgment	
aL	active, status message requiring acknowledgment and troubleshooting	
iQ	inactive, status message requiring acknowledgment	

"Status messages" table

No.	Status			Message	Reaction/troubleshooting
110	A	S	a	The device is booting.	
116	A	S	a	The PROFIBUS® module has been installed in a wrong slot!! The interface is therefore not functional. Please install the PROFIBUS® module in slot X20/X21.	install the PROFIBUS® module in slot X20/X21.
119	A	S	iQ	The configuration could not be loaded! This device does not currently contain a configuration. Please load a configuration with the use of TCT.	Load configuration with TCT. Notify Service if this occurs again.
120	F		a	The maintenance switch is ON.	
121			aL	The limit value has alarm status.	
122	A	S	a	The IO module is faulty.	Replace the IO module.
123	A	S	a	Communication error while accessing the IO module.	Replace the IO module.
124			iQ	The configuration data was corrupt! The configuration has been restored using backup data.	
125			a	The limit value has alarm status.	
126	W		a	The QAL3 data memory is full. Please export the data.	Export QAL3 data.
127	W		a	The drift values up-scale the QAL3 limits.	Repeat calibration. Initiate maintenance of the AMS.
250	A	S	aQ	The analyzer could not be found.	Check plug connection and wiring.
251	A	S	aQ	The connection to the analyzer was lost!	Check plug connection and wiring.
252	A	S	aL	The EEPROM data of the analyzer are faulty.	Check configuration with TCT.
253	A	S	aL	The communication with the analyzer is disrupted,	Check plug connection and wiring.
254	A	S	a	The boot program of the analyzer is faulty! Notify Service!	Notify Service.
255	A	S	a	The program of the analyzer is faulty! Notify Service!	Notify Service.

... 12 Diagnosis / Troubleshooting

... Possible status messages

No.	Status			Message	Reaction/troubleshooting
300	A	S	aL	No new measured values from the analog/digital converter.	Notify Service.
301	A	S	a	The measured value exceeds the value range of the analog/digital converter.	Check sample gas concentration. Check connectors on the gas analyzer. Notify Service.
302	W		aQ	The offset drift up-scales half of the range permissible.	Observe drift. As long as the drift is below the value specified in the measurement data, the measured value is OK. As soon as the drift exceeds this value, notify Service.
303	A	S	aQ	The offset drift up-scales the permissible range.	Notify Service. Perform basic calibration (with TCT).
304	W		aQ	Amplification drift up-scales half of allowed range.	Observe drift. As long as the drift is below the value specified in the measurement data, the measured value is OK. The detector concerned will need to be changed soon. Calibrate the detector displayed manually at the zero point and span point. Permissible range: 50% of the sensitivity of the detector. As soon as the drift exceeds this value, notify Service.
305	A	S	aQ	The amplification drift up-scales the permissible range.	Have affected detectors replaced. Notify Service. Perform basic calibration (with TCT).
306	W		aQ	The offset drift between two calibrations exceeds the permissible range.	Adjust detector displayed manually at the zero point (This message is created by the automatic calibration) Permissible range: 15 % of the smallest measuring range that has been installed; 6 % of the smallest measuring range that has been installed for measurements on systems subject to approval and systems of the 27th and 30th. BImSchV
307	W		aQ	The offset drift between two calibrations up-scales the permissible range.	Calibrate the detector displayed manually at the end point. (This message is created by the automatic calibration) Permissible range: 15 % of sensitivity; 6 % of the sensitivity when measuring on installations that are subject to approval and installations of 27 and 30 BImSchV
308	A	S	aQ	A calculation error occurred while calculating the measured value.	Power-up and power-down the power supply. Notify Service.
309	W		a	The thermostat works erroneously.	Notify Service.
310	W		a	The temperature correction for this component was deactivated because the temperature measured value is faulty.	Notify Service.
311	A	S	a	The pressure regulator works erroneously.	see status message of the relevant pressure detector
312	W		a	The pressure correction for this component was deactivated because the pressure measured value is faulty.	Notify Service.
313	W		a	No excess sensitivity correction for this component is possible, as the correction value is faulty.	Check with TCT.
314	W		a	No carrier gas correction for this component is possible, as the correction value is faulty.	Check with TCT.
315	W		aL	No new measured values from the analog/digital converter.	Notify Service.

No.	Status			Message	Reaction/troubleshooting
316	W		a	The measured value exceeds the value range of the analog/digital converter.	Notify Service.
317	W		a	A calculation error occurred while calculating the measured value.	Notify Service.
324	W		a	The temperature exceeds or falls below the top or bottom limit value 1.	Status messages during the warm-up phase. If the status message occurs after the warm-up phase: check whether the permissible
325	W		a	The temperature exceeds or falls below the top or bottom limit value 2.	ambient temperature range is observed. Check the connection leads and connectors. Check the fit of the leads in the wire end ferrules. Check the overheating protection in the analyzer module and replace it if necessary.
326	A	S	aL	No new measured values from the analog/digital converter.	Notify Service.
327	A	S	a	The measured value exceeds the value range of the analog/digital converter.	Notify Service.
328	A	S	a	A calculation error occurred while calculating the measured value.	Notify Service.
329	W		a	The pressure up-scales or down-scales the top or bottom limit value 1.	Fidas24: Check supply gas pressures.
330	W		a	The pressure up-scales or down-scales the top or bottom limit value 2.	Fidas24: Check supply gas pressures.
331	A	S	a	The position value of the flow controller is outside the valid area.	Fidas24: Check supply gas pressures.
342	W		a	The flow rate down-scales the limit value 1.	Check sample conditioning. Limit value 1 = 25 % MBU.
343	A	S	a	The flow rate down-scales the limit value 2.	Check sample conditioning. Limit value 2 = 10 % MBU. The automatic calibration has been interrupted and blocked.
378	A	S	aL	Chopper wheel is blocked.	Visual inspection. Notify Service.
379	A	S	aL	Chopper wheel speed not OK.	Notify Service.
380	A	S	aL	Faulty IR beam or electronics.	Notify Service.
381	A	S	aL	High voltage defective on the preamplifier.	Notify Service.
382	A	S	aL	Measured value is influenced by vibrations.	
390	A	S	aQ	Failure of the internal power supply. Notify Service!	Notify Service.
397	A	S	a	The temperature controller sensor is faulty.	Notify Service.
398	A	S	aL	No new measured values from the analog/digital converter.	Notify Service.
399	A	S	a	The measured value exceeds the value range of the analog/digital converter.	Check sample gas concentration. Check connectors on the gas analyzer. Notify Service.

… 12 Diagnosis / Troubleshooting

… Possible status messages

No.	Status			Message	Reaction/troubleshooting
400	A	S	a	A calculation error occurred while calculating the measured value.	Power-up and power-down the power supply. Notify Service.
401	W		a	The flow up-scales or down-scales the top or bottom limit value 1.	Check measuring gas path. Notify Service.
402	A	S	a	The flow up-scales or down-scales the top or bottom limit value 2.	Check measuring gas path. Notify Service.
403	A	S	a	The position value of the flow controller is outside the valid range.	Notify Service.
404	A	S	a	The temperature exceeds or falls below the top or bottom limit value 2.	Notify Service.
500			iQ	An internal calibration error has occurred.	Repeat calibration. Check configuration with TCT. Notify Service.
501			iQ	The requested functionality is not available in the device.	Check configuration with TCT.
502			iQ	A calibration error occurred in the device.	Calibration interrupted. Notify Service.
503	W	S	iQ	The sensitivity is too low! The calibration was aborted.	Incorrect test gas! Check test gas supply and connection; repeat calibration.
508			iQ	Unknown calibration error. Check configuration.	Message during automatic calibration. Check configuration with TCT.
511			iQ	Auto calibration aborted.	for information
512	F		a	Autocalibration running.	for information
513			iQ	An internal calibration error has occurred.	Repeat calibration. Check configuration with TCT. Notify Service.
517	F		a	Device is being serviced.	
518			iQ	Calibration could not be performed because the measured value is unstable.	Check test gas supply and connection; repeat calibration.
519			iQ	Calibration could not be performed because the preamplifier is overranged.	Check test gas supply and connection; repeat calibration.
529	W	S	iQ	The calibration was canceled, as no raw measured values can be entered.	Check test gas supply and connection; repeat calibration.
538	W	S	iQ	The zero calibration was aborted because the analyzer is dirty! (Reference detector)	Clean sample cell. Notify Service.
539	W	S	iQ	The zero calibration was aborted because the analyzer is dirty! (measuring detector)	Clean sample cell. Notify Service.
801	A	S	a	An external failure has occurred.	Input signal at the correspondingly configured digital input.
802	W		a	An external maintenance need has occurred.	Input signal at the correspondingly configured digital input.
803	F		a	A function check defined by the user has occurred.	Input signal at the correspondingly configured digital input.

Troubleshooting

Flow error

Gas lines or filter contaminated, clogged up or leaky

- disconnect the gas analyzer from the gas treatment system.
- blow out the lines with compressed air or unblock them mechanically.
- replace filter inserts and fill material.
- check gas lines for leaks.

Gas paths in the gas analyzer kinked or leaky

- disconnect the gas analyzer from the gas treatment system.
- Check whether the gas lines in the gas analyzer are kinked or have become detached from the connections.
- Check the gas feed paths in the gas analyzer for leak tightness (see **Checking the leak tightness of the sample gas or reference gas path** on page 102).

Outlet pressure not the same as atmospheric pressure

- Make sure that the outlet pressure is the same as the atmospheric pressure.
- Guide exhaust gases directly into the atmosphere or through a line with a large internal diameter which is as short as possible, or into a gas discharge line.
- Do not guide exhaust gases via restrictions or shut-off valves.

Unstable display of measured value

Vibrations

- Provide measures to reduce the vibrations.
- Increase the low pass time constant (see **Set low-pass time constant** on page 71).

Leaks in the gas feed paths

Check the gas feed paths in the gas analyzer for leak tightness, (see **Checking the leak tightness of the sample gas or reference gas path** on page 102).

Loss of sensitivity

Check amplification drift display of the sample component (see **Drift indicator** on page 98).

Uras26: Emitter modulation uneven

Have the emitter and modulator checked by ABB Service.

... 12 Diagnosis / Troubleshooting

Notify Service

Who should you contact for further help?
Please contact your local service representative. For
emergencies, please contact:

To find your local ABB contact visit:
www.abb.com/contacts

For more information visit:
www.abb.com/measurement

Before you notify Service ...
Before contacting the service department regarding a
malfunction or a status message, please check whether there is,
in fact, a fault in the sense that the gas analyzer is not complying
with the metrological data (refer to data sheet).

When you notify Service ...
When you notify Service because of a malfunction or a status
message, have the following information available:
   • The Manufacturing number r (M-No.) of the gas analyzer -
     you will find it on the name plate and in the analyzer data
     sheet;
   • the software version for the gas analyzer - you will find it
     in the analyzer data sheet and in the menu item
     '▼ Maintenance / ▼ Diagnosis / ▶ Device Info';
   • an exact description of the problem or status as well as
     the status message number.

This information will enable the service personnel to help you
quickly.
Have the analyzer Data Sheet ready – it contains important
information that will help the Service personnel to find the cause
of the malfunction.

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 111) 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

Transport-/Storage temperature
   −25 to 65 °C

13 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.

Use in potentially explosive Atmospheres
The inspection and maintenance of the explosion-protected version of the gas analyzer requires special knowledge.
- Repairs and replacement of parts on the device may only be done by ABB service.
- For information on returning the device, refer to **Returning devices** on page 94.

Inspection

Regular inspection
Proceed according to the checklist under **Installation Check** on page 39.

Check leak tightness of the gas paths
The leak tightness of the sample gas path and, if applicable, the reference gas path must be checked at least once a year during operation.

The leak tightness of the sample gas path must always be checked after the sample gas path has been opened inside the gas analyzer (see **Measures to be taken after each opening of the gas paths in the gas analyzer** on page 96).

If incoming measured values are creeping during operation (e.g. after test gas is switched on) or implausible measured values appear, a leak in the sample gas path is the possible cause.

... 13 Maintenance

... Inspection

Measures to be taken after each opening of the gas paths in the gas analyzer

- All parts of the housing of the control unit and the EL3060-Uras26 analyzer unit must be screwed together as far as they will go and secured against twisting with hexagon socket screws.
- If the sample gas path or the reference gas path in 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, see **Checking the leak tightness of the sample gas or reference gas path** on page 102.

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

Resealing the cable glands after opening

If the flameproof cable glands through which the data transmission cable and the 24 V DC connection cable are guided into the flameproof cylinder of the EL3060-Uras26 analyzer unit have been opened, the outer nuts must be tightened with a torque wrench (SW 20); tightening torque = 17 Nm.

Maintenance switch

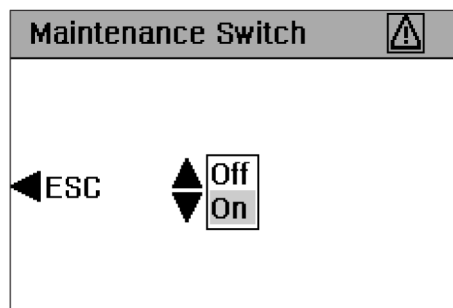**Menu path**
> '▼ Maintenance / ▶ Maintenance Switch'

Figure 49:　'Maintenance switch' Menu "

Function of the maintenance switch

The maintenance switch is used to set the "Function check' status (see **Status messages – Explanations** on page 86) as long as maintenance is carried out on the gas analyzer, such as a leak tightness test.

While the maintenance switch is set to 'On', the ⚠ icon on the LCD display flashes.

The 'Function check' status signal is issued; thus, the gas analyzer signals that the current measured values are to be discarded as process measured values.

Perform calibration reset

Menu path
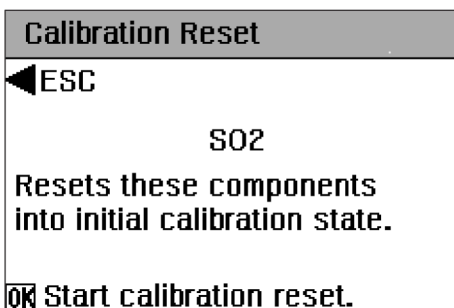'▼ Maintenance / ▶ Basic Settings / ▶ Calibration Reset'

```
┌─────────────────────────────────┐
│ Calibration Reset               │
├─────────────────────────────────┤
│ ◀ESC                            │
│                                 │
│            SO2                  │
│    Resets these components      │
│    into initial calibration state. │
│                                 │
│ OK Start calibration reset.     │
└─────────────────────────────────┘
```

Figure 50:   'Calibration reset' menu

When should the calibration reset be performed?
A calibration reset should only be performed if an analyzer module can no longer be calibrated by normal means.
A possible cause of this could be that for example, the gas analyzer was calibrated with the incorrect test gases.

What does the calibration reset do?
The calibration reset restores the calibration of the gas analyzer to a factory-set base calibration state.
Furthermore, the offset drift and amplification drift are electronically returned to base calibration values.

Status signal
The'Function check' status signal is set during the calibration reset, see **Status messages – Explanations** on page 86.

Note
The calibration reset cannot be performed while an automatic calibration is in progress.

Uras26 – measuring the calibration cell

Menu Path
'▼ Maintenance / ▶ Basic Settings / ▼ Measure Cal. Cell'

```
┌─────────────────────────────────┐
│ Measure Cal. Cell               │
├─────────────────────────────────┤
│ ◀ESC                            │
│                                 │
│   ┌───────────────────────────┐ │
│   │ SO2            1023ppm    │ │
│   │ Set Point      1022ppm    │ │
│   └───────────────────────────┘ │
│ OK Start measurement.           │
└─────────────────────────────────┘
```
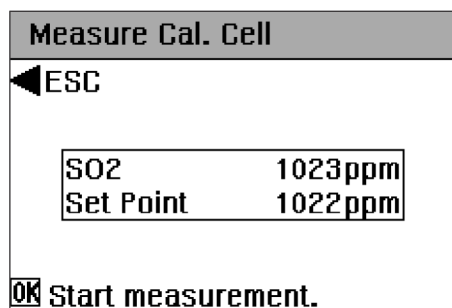
Figure 51:   Menu 'Measure Cal. Cell'

Definition
When measuring the calibration cell, the current concentration of the calibration cell is determined by test gases. The measured concentration is stored as a set point for calibration with the calibration cell.

When do calibration cells need to be measured?
We recommend measuring the calibration cells once a year.
In addition, er recommend measuring the calibration cell after the measuring range set by the user has been calibrated with test gases for the first time and whenever the test gas has been changed.

Before measuring the calibration cells
Prior to measuring the calibration cells, the zero and end points of the applicable sample components must be calibrated with test gases.

Connect the zero gas supply.
During calibration cell measurement, the zero gas supply must be connected.

Status Signal
While the calibration cell is being calibrated, the 'Function check' status signal is active (see **Status messages – Explanations** on page 86).

Note
The calibration cell cannot be measured while an automatic calibration is in progress.

... 13 Maintenance

Drift indicator

Menu Path
'▼ Maintenance / ▼ Diagnosis / ▼ Device Status /
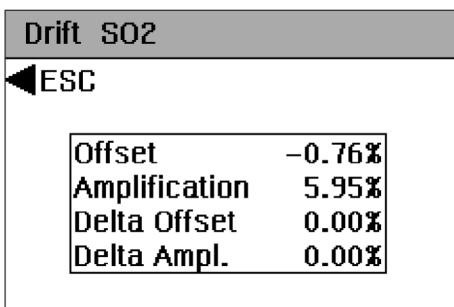▶ Analyzer Status / ▶ Drift'

Figure 52: 'Drift indicator' menu

Drift
The offset and amplification drift values are calculated cumulatively starting from the last basic calibration.

Delta drift
The offset and amplification Delta drift values are calculated between the last and next to last automatic calibration. They are deleted by manual zero point or end-point calibration.

Note
The drift values are displayed in percent of the customer measuring range, i.e. the factory-set measuring range (see **Limits of measuring ranges** on page 65) (see **Analyzer data sheet** on page 24).
The drift values are cleared by a calibration reset.

Pressure correction

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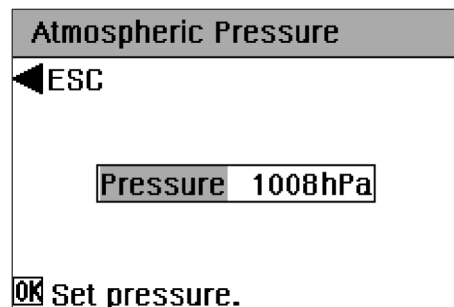'▼ Maintenance / ▶ Basic Settings / ▲ Atmospheric Pressure'

Figure 53: '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 21), 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.

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 **Status Signals** on page 86.

Device test

Menu Path

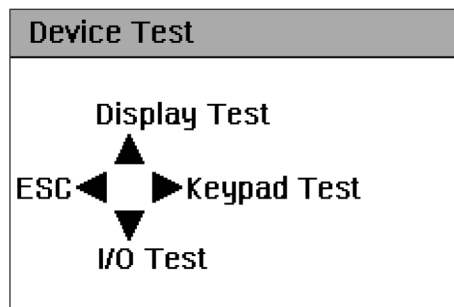'▼ Maintenance / ▼ Diagnosis / ▲ Test Functions / ▲ Device Test'

Figure 54:   Menu 'Device Test'

Display Test

Figure 55:   Display test

Test:

On the indicator, a gray level field runs horizontally from right to left over which a text box moves.

The display test is terminated by pressing any button.
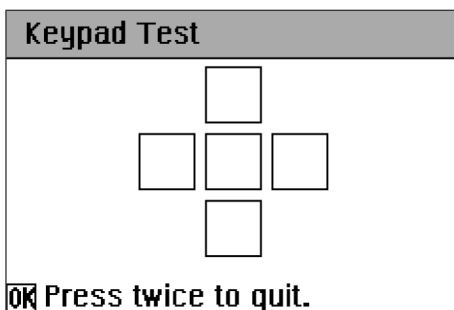
... 13 Maintenance

... Device test

Keypad Test

Figure 56:   Keypad Test

5 square fields appear on the display.

Test:

    If the user presses any button, the respective field that is assigned to the button is inverted (becomes dark) for as long as the button remains pressed.

The keyboard test is terminated by pressing the **OK** key twice.

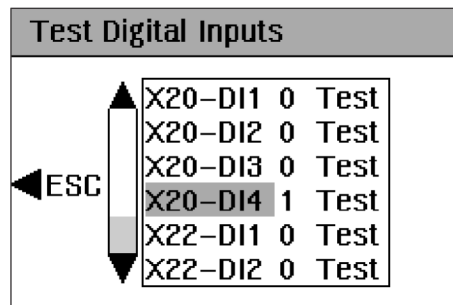**I/O Test (Test of inputs and outputs)**

Testing the digital inputs

Figure 57:   Menu 'Test Digital Inputs'

The list shows the digital inputs (DI) that are available on the digital I/O modules installed in the device, see **Digital inputs** on page 30.

They are designated according to the installation locations of the digital I/O modules (X20, X22, X24, X26).

Test:

1. Disconnect the plug with the connected signal lines from the Digital I/O module.
2. Close the digital input to be tested with a wire jumper or similar.
   Result:
   The status indication changes from 'OK' to 'Test' and the 'Function check' status signal is set.
   The function assigned to the digital input is not activated during the test.
3. Test another digital input in the same manner.

The digital inputs test is terminated by pressing the ◀ button or after approximately 5 minutes by the time-out function, which resets all digital inputs to the 'OK' state and deletes the 'Function check' status signal.
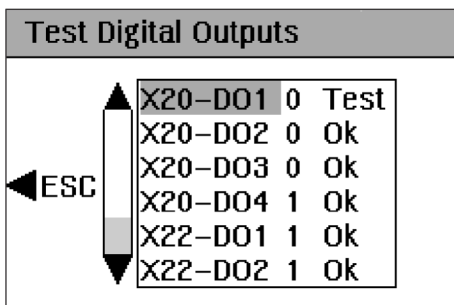
Digital output test

Figure 58: Menu 'Test Digital Outputs'

The list shows the digital outputs (DO) that are available on the digital I/O modules installed in the device, see **Digital outputs** on page 30.

They are designated according to the installation locations of the digital I/O modules (X20, X22, X24, X26).

Test:
1. Disconnect the plug with the connected signal lines from the Digital I/O module.
2. Select the digital output to be tested with ▲ or ▼.
3. Call up the value change using ▶.
4. Change the displayed value with ▲ or ▼, and confirm the change by selecting**OK**.
   Result:
   The relay at the digital output is switched, the status indication changes from 'OK' to 'Test' and the 'Function Check' status signal is set.
5. You can either test another digital output or reset the tested digital output in the same manner.

The digital outputs test is terminated by pressing the ◄ button or after approximately 5 minutes by the time-out function, which resets all digital inputs to the 'OK' state and deletes the 'Function check' status signal.
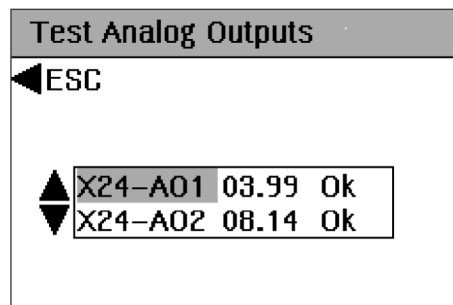
Test of analog outputs

Figure 59: Menu 'Test Analog Outputs'

The list shows the analog outputs (AO) that are available on the analog output modules installed in the device, see **Analog outputs** on page 34.

They are designated according to the installation locations of the analog output modules (X20, X22, X24, X26).

Test:
1. Disconnect the plug with the connected signal lines from the analog output module.
2. Select the analog output to be tested with ▲ or ▼.
3. Call up the value change using ▶.
4. Change the displayed value digit for digit with ▲ or ▼ and confirm the change by selecting **OK**.
   Result:
   The current signal at the analog output changes its value, changes the status indication from 'OK' to 'Test' and sets the 'Function check' status signal on the analog output.
5. You can either test another analog output or reset the tested analog output in the same manner.

The analog output test is terminated by pressing the ◄ button or after approximately 5 minutes by the time-out function, which resets all digital inputs to the 'OK' state and deletes the 'Function check' status signal.

... 13 Maintenance

Instrument information

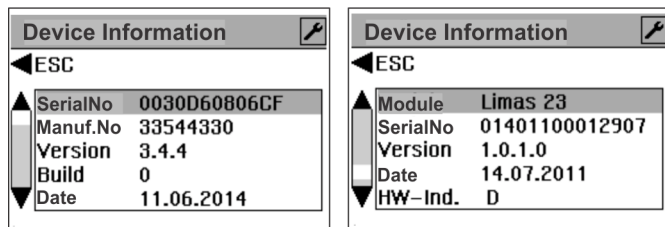### Menu Path

'▼ Maintenance / ▼ Diagnosis / ▶ Device Info'

Device Information 🔧	Device Information 🔧
◀ESC	◀ESC
▲ SerialNo 0030D60806CF	▲ Module Limas 23
Manuf.No 33544330	SerialNo 01401100012907
Version 3.4.4	Version 1.0.1.0
Build 0	Date 14.07.2011
▼ Date 11.06.2014	▼ HW-Ind. D

Figure 60: **'Device information' Menu**

Display

Both the serial number and the version number, the date of the software and the hardware index are shown for the device and the integrated assemblies.

Checking the leak tightness of the sample gas or reference gas path

When does the leak tightness of the sample gas or reference gas path have to be checked?

The leak tightness of the sample gas or reference gas path should be checked on a regular basis.

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

The leak tightness of the sample gas or reference gas path must always be checked after the sample gas or reference gas path has been opened in 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.

Maintaining the corrosion protection of the housing

In order to continuously maintain the corrosion protection of the central unit's housing and to ensure low-friction screwing in, the thread housing cover must be lubricated each time the housing is opened.

Preferably, use copper paste.

Replacing the battery

• The battery may only be replaced in a non-hazardous atmosphere.
• This battery may only be replaced with the original battery type:
  – Varta CR 2032 type no. 6032 or
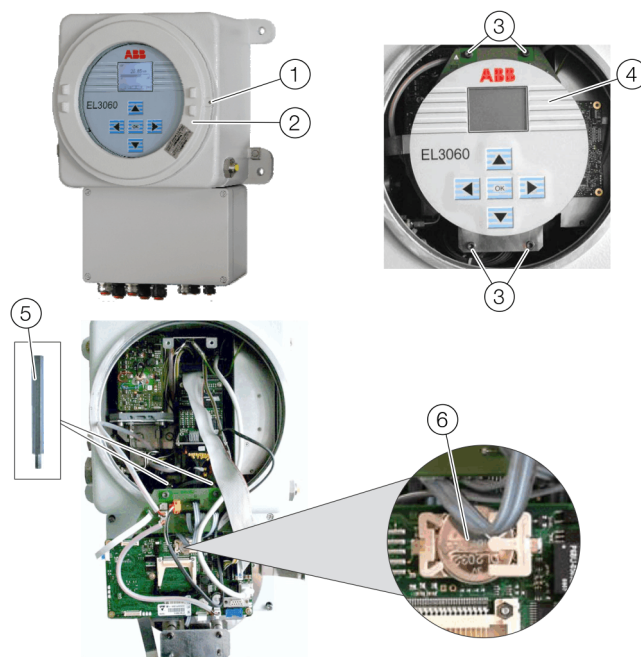 – Renata Type No. CR2032 MFR

Figure 61: Replacing the battery

1. Switch off the gas analyzer power supply.
2. Loosen the Allen screw ① on the edge of the housing cover.
3. Turn the cover ② counter-clockwise, the cover can be removed after approx. 5 turns.
4. Loosen the four Allen screws ③ of the LCD indicator. Carefully remove the LCD indicator ④.
5. Screw in the supplied extension bolts ⑤ into the lower stud bolts of the bracket of the LCD display.
6. Turn the LCD indicator and screw it onto the extension bolt with two Allen screws.
7. Remove the old buffer battery ⑥ and replace with a new battery of one of the types specified above.
8. Refit the LCD indicator in reverse order.
9. Lubricate the housing cover thread, see **Maintaining the corrosion protection of the housing** on page 103.
10. Screw the cover ② on tightly again and secure it with the Allen screw ①.
11. Turn on the gas analyzer power supply.
12. Reset the time and date, refer to **Setting the date and time** on page 76.

14 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.

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 111).
- See the information in **Returning devices** on page 94!

Transport-/Storage temperature
−25 to 65 °C

15 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.

16 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.

... 16 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.

... 16 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

17 Additional documents

Note

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

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18 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

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

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