

# AO2040-Fidas24 Ex

## Continuous gas analyzers



Flame ionization analyzer for use in potentially explosive atmospheres

**Measurement made easy**

AO2040-Fidas24 Ex

### Introduction

The AO2040-Fidas24 Ex makes an impression with its compact design and has been specially developed for potentially explosive atmospheres. All relevant explosion protection measures are installed at the factory and certified.

The IP 65 housing with a robust design, combined with a Ex-p pressurized enclosure, meets the requirements for use in potentially explosive atmospheres of Zone 1, Zone 2, as well as Zone 21 and Zone 22 in accordance with European ATEX regulations and international IECEx regulations.

Ex-p protection is based on a continuous purge. Due to the already very high protection level of the Fidas24 analyzer module, the use of simple instrument air as the purge medium is sufficient. There is no need to use expensive nitrogen in addition to the instrument air, which is required anyway.

### Additional Information

Additional documentation on AO2040-Fidas24 Ex is available for download free of charge at [www.abb.com/analytical](http://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.

## Intended use

The gas analyzer AO2040-Fidas24 Ex is designed to provide continuous measurement of the concentration of the individual components in gases or vapors.

The gas analyzer AO2040-Fidas24 Ex is suitable for use in Category 3G, 3D, 2G and 2D (EPL Gc, Dc, Gb, Db) hazardous areas, provided that the specification (refer to **Specification** on page 73) and the special operating conditions (refer to **Use in potentially explosive atmospheres** on page 7) are adhered to.

Any other use is not approved.

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

The gas analyzer AO2040-Fidas24 Ex must not be used for the measurement of mixtures that could ignite during operation. Special measures must be taken to prevent an explosion hazard during the measurement of combustion gas which can form an explosive mixture in association with air or oxygen.

The following models of the gas analyzer AO2040-Fidas24 Ex are available, refer to **Ex marking and versions** on page 7:

- In Protection Class II 3G
- In Protection Class II 3D
- In Protection Class II 2G
- In Protection Class II 2D

The special conditions required for the safe operation of the gas analyzer in the respective protection classes can be found in the corresponding subchapters.

## ... 1 Safety

### ... Intended use

#### Important safety note

According to EU Directive 2014/34/EU and the general requirements for equipment installed in explosive atmospheres stated in IEC 60079-0, the scope of the certification of our equipment is limited to **atmospheric conditions**, unless specified otherwise in our certificates.

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#### 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 a normal oxygen content, typically 21% Vol.-% |                                |

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If the atmospheric conditions are not met, the operator is obliged to ensure the safe operation of our equipment outside the atmospheric conditions by further measures (e.g. evaluation of the gas mixture or the 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.

### 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.

**Protective lead connection**

The protective lead (ground) should be attached to the protective lead connector before any other connection is made.

**Risks of a disconnected protective lead**

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

**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.

** 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.
- Turn off the power supply before opening the device, and observe a waiting period of 20 minutes, in order to allow any hot components to cool down.

**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.

**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.

**Notes on data safety**

This product is designed to be connected to a network interface and to communicate information and data via this network interface.

It is the 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).

The operator must implement and uphold appropriate measures (such as the installation of firewalls, the application of authentication measures, data encryption, the installation of anti-virus programs, etc.), in order to protect the product, the network, the connected systems and the interface from any breaches of security, unauthorized access, interference, intrusion, loss and/or theft of data or information.

ABB Automation GmbH and its subsidiaries do not accept liability for any damage and/or loss resulting from such breaches of security, unauthorized access, interference, intrusion or loss and/or theft of data or information.

**Services and ports on the Ethernet interface**

| Port     | Description  |
|----------|--|
| 22/tcp   | Used for software update only.<br>No direct access to the device.  |
| 502/tcp  | Used for Modbus/TCP.<br>The device allows connection to any Modbus client. The port must be activated via the LCD indicator, the port is delivered in a deactivated state. |
| 8001/tcp | Used for Test and Calibration Software.<br>Binary, proprietary protocol.   |

**Access authorizations**

Access to the calibration and to the menus used to change the configuration of the instrument is restricted by password protection.

It is recommended that the factory-set passwords be changed by the operator, see **Password protection** on page 70.

## ... 1 Safety

### Manufacturer's address

**ABB Automation GmbH**  
**Measurement & Analytics**  
Stierstädter Str. 5  
60488 Frankfurt am Main  
Germany  
Tel: +49 69 7930-4666  
Email: [cga@de.abb.com](mailto:cga@de.abb.com)

### Service address

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

For emergencies, please contact:

#### Customer service center

Tel: +49 180 5 222 580  
Email: [automation.service@de.abb.com](mailto:automation.service@de.abb.com)

## 2 Use in potentially explosive atmospheres

### Ex marking and versions

The different versions and the corresponding Ex markings are listed below.

#### Standards and directives

All models comply with the regulations of the European Directive 2014/34/EU (ATEX Directive / IECEx-Scheme ), and they are manufactured in accordance with the following standards:

- EN/IEC 60079-0
- EN/IEC 60079-2
- EN/IEC 60079-19

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.

#### Temperature class

The gas analyzer corresponds to the Temperature Class T3.

### Versions

| Design  | Product code                                | Type examination certificate / Ex marking  | Further requirements   |
|---|---|--|--|
| Category "3G",<br>Equipment protection level "Gc" | 24041- XXX2XXXXXXXXX oder<br>XXX3XXXXXXXXXX | <b>ATEX</b><br>BVS 20 ATEX E 049 X<br> II 3G Ex pxb ib IIC T3 Gc<br><b>IECEX</b><br>IECEX BVS 20.0039X<br>Ex pxb ib IIC T3 Gc                       | —  |
| Category "2G",<br>Equipment protection level "Gb" | 24041-XXX1XXXXXXXXXX                        | <b>ATEX</b><br>BVS 20 ATEX E 048 X<br> II 2G Ex pxb ib IIC T3 Gb<br><b>IECEX</b><br>IECEX BVS 20.0039X<br>Ex pxb ib IIC T3 Gb                     | Installation of an additional interface relay for connections on the operator's side, if these can still remain live after the power supply has been switched off or if the pressurized encapsulation fails.<br><b>Connecting the interface relay</b> on page 50   |
| Category "3D", Equipment<br>protection level "Dc" | 24041-XXX8XXXXXXXXXX                        | <b>ATEX</b><br>BVS 20 ATEX E 049 X<br> II 3D Ex pxb ib [ib] IIIC T195°C Dc<br><b>IECEX</b><br>IECEX BVS 20.0039X<br>Ex pxb ib [ib] IIIC T195°C Dc | Installation of a key switch to confirm that the interior of the housing has been cleaned of dust during commissioning.<br><b>Connecting the key switch</b> on page 49   |
| Category "2D", equipment<br>protection level "Db" | 24041-XXX7XXXXXXXXXX                        | <b>ATEX</b><br>BVS 20 ATEX E 048 X<br> II 2D Ex pxb ib [ib] IIIC T195°C Db<br><b>IECEX</b><br>IECEX BVS 20.0039X<br>Ex pxb ib [ib] IIIC T195°C Db | Installation of an additional interface relay for connections on the operator's side, if these can still remain live after the power supply has been switched off or if the pressurized encapsulation fails.<br><b>Connecting the interface relay</b> on page 50<br>Installation of a key switch to confirm that the interior of the housing has been cleaned of dust during commissioning.<br><b>Connecting the key switch</b> on page 49 |

## ... 2 Use in potentially explosive atmospheres

### Special conditions

#### Using in category 3G / 3D

When using in category 3G / 3D, observe the following requirements:

- The analysis of explosive gas mixture is not permitted.
- The analysis of gas mixture is only allowed for a pressure limit up to 1100 hPa.
- The measurement function for the explosion protection is not part of this examination.

#### Using in category 2G / 2D

When using in category 2G / 2D, observe the following requirements:

- The analysis of explosive gas mixture is not permitted.
- The analysis of gas mixture is only allowed for a pressure limit up to 1100 hPa.
- For the necessary shutdown of the gas analyser by default of the pressurized enclosure, a separately certified cut-off relay has to be used (only for EPL Gb / Db).
- The measurement function for the explosion protection is not part of this examination.



## Installation of the gas analyzer and the gas connections

The operator must observe the conditions listed in this chapter when installing and operating the gas analyzer in hazardous areas.

The conditions are grouped thematically, based on the life phases of the gas analyzer.

### Standards and directives

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

- EN/IEC 60079-2, Annex D
- EN/IEC 60079-14
- IEC/TR 60079-16
- IEC 61285

### Specification

#### Sample gas

The gas analyzer may only be used for the measurement of combustion gases, provided that the following conditions are adhered to:

- The sample gas that is fed in must at no time, exceed the C1-equivalent of 8 Vol-% CH<sub>4</sub>.
- The sample gas that is fed in must not be potentially explosive.
- The specifications must also be adhered to during the start-up and shut-down processes, and the pressure, temperature and gas matrix must be taken into account.
- The relevant safety regulations for working with combustion gases must be complied with.

### Note

8 Vol.-% CH<sub>4</sub> or C1-equivalents exceed the lower explosion limit (UEG).



An explosive mixture of gases is defined as a mixture containing combustion components, that falls within the lower (UEG) and upper explosion limits (OEG), which is accompanied by the simultaneous presence of oxidizers (e.g. air, oxygen).

- Gas mixtures with combustion gas components that exceed the respective gas-specific lower explosion limits (UEG) may only be fed into the gas analyzer if it has been ascertained that the gas mixture is non-explosive.
  - This can be achieved by excluding the presence of atmospheric oxygen and/or other oxidizers.
- If the operator is unable to guarantee this, or if he is not sure about the composition of the gas mixture, the sample gas mixture may not be fed into the analyzer.

### Combustion gas and combustion air

- The maximum pressures of combustion gas and combustion air may not be exceeded, refer to **Operational gases** on page 22.
- The operator must take appropriate measures to ensure that the pressure of the combustion gas does not exceed 6 bars (abs), even in the case of a fault.
- The maximum flow of combustion gas must not be exceeded, refer to **Combustion gas parameter** on page 23.
- The relevant safety regulations for working with combustion gases must be complied with.

### Instrument and purge air (inert gas)

- If the inert gas and instrument air supply are connected to a single source, the quality requirements for the instrument air must be adhered to, refer to **Properties of the instrument air** on page 22.
- If the inert gas supply is separate from the instrument air supply, the (lower) quality requirements specified in the operating manual for the purging and monitoring unit FS870S must be adhered to for the inert gas.

## ... 2 Use in potentially explosive atmospheres

### ... Installation of the gas analyzer and the gas connections

#### Installation of the purge gas supply (inert gas)

The purge gas supply to the system housing of the gas analyzer must be configured by the operator in accordance with the requirements, as specified below.

However, the list of requirements does not exempt the operator from his duty of care in implementing the installation of the gas analyzer and the associated supply lines, in accordance with the applicable national and international standards and regulations, including any additional requirements that might apply.

#### Installation of the purging gas supply lines

- The source of the purging gas (compressor intake) must not be located in the explosion hazardous area, except in the case of a purging gas supply from cylinders.
- The purging gas supply lines must be installed outside of the hazardous area if possible.
- If the purging gas supply lines are laid within the explosion hazardous area, the supply lines must be made of a non-combustion material, and measures must be taken to protect them from mechanical damage and corrosion.
- If the purging gas pressure within the purging gas supply lines is lower than the ambient pressure, measures must be taken to ensure that no potentially explosive atmosphere can enter the purging gas supply line.
- Ensure that, in case of failure of the purging gas supply, no combustion gases or dusts can flow into the non-explosive area via the purging gas supply lines

#### Adjusting the purging time of the pressurized encapsulation

The pre-purge volumes to be considered as specified in the EN 60079-2 standard, Annex D.2.4, have already been included in the present analyzer via a 15 L buffer. This means that with a pre-purge using five times the volume, typical lines volumes between the shut-off valve / pressure reducer and the purge gas inlet valve in the amount of 3 L (15 L / 5) are considered.

If the free volumes of the connected lines should nevertheless up-scale 3 L (with an internal pipe diameter of 8 mm, this corresponds to a line length of 60 m), you should consult ABB Service regarding the adjustment of the pre-purge volume and the purging parameters associated with it.

#### Temperature of the purging gas

Ensure that, inside the purging gas supply line, the dew point of the purging gas is not undershot.

#### Power supply for the inert gas supply

The power supply for the inert gas supply (blower, compressor etc.) must be via a circuit that is separate from that of the gas analyzer.

Alternatively, the power supply for the inert gas supply can be connected to the power supply for the purging and monitoring unit.

#### Containment system

The gas paths that come into contact with the combustion and sample gas are designed in the form of a containment system, in accordance with the IEC 60079-2 standard.

- Ensure that the permitted properties (composition, pressure, temperature and flow rate) of the measuring and operational gases are adhered to, refer to **Sample gas** on page 22 and **Operational gases** on page 22.
- Ensure that the specification, warnings and maintenance instructions for the device, as provided in the operating instruction, are adhered to.

#### Note

Additional precautions may be required if the rating of the surrounding atmosphere could be affected by the unintentional release of combustion gases in the event of a fault (zone elevation).

## Installation

The following requirements and conditions must be adhered to when installing the gas analyzer and the gas lines.

### Installation site requirements

- The unobstructed exchange of air with the environment must be possible around the gas analyzer. The gas analyzer must not be directly covered. The outlet and the pressure compensation vent of the purging and monitoring unit FS870S may not be closed.
- All of the plastic and elastomer components of the housing must be protected against UV radiation.

### Requirements for models II 3G / Gb and II 2G / Gb

- The housing must be protected against brush discharges or electrostatic charging; the housing may only be cleaned with a moist cloth.

### Requirements for the Models II 3D/Dc and II 2D/Db

- Due to the risk of electrostatic charging of the painted surface of the housing, the gas analyzer AO2040-Fidas24 Ex may not be installed in areas with an increased risk of charging (e.g. near filling systems).
- Suitable measures must be taken for the blow-off vent (inert gas outlet) of the purging and monitoring unit FS870S, in order to prevent a zone elevation, due to dust being stirred up.  
It is preferable to evacuate the ignition protection gas into a dust-Ex free area.
- The operator must install a suitable key switch, in order to confirm that the interior of the housing is cleaned before commissioning, refer to **Connecting the key switch** on page 49.
- The operator must ensure that the inside of the housing is cleaned of dust before the gas analyzer is switched on. The initial purging of the housing is not intended for the purpose of cleaning the housing!

### Connecting the combustion gas and the combustion air supply

- Observe the connection diagram when connecting the combustion gas and the combustion air supply, refer to **Connection diagram for the operational gases** on page 30.
- The combustion gas path in the gas analyzer must not be opened! The combustion gas path can become leaky as a result! Escaping combustion gas can cause fires and explosions, also outside the gas analyzer!
  - If the combustion gas path in the gas analyzer has been opened nonetheless, it must be checked for leakage (refer to **Check the integrity of combustion gas path** on page 60), using a leak detector (leak rate  $< 1 \times 10^{-4}$  hPa l/s), once it has been closed again.
- The leak tightness of the combustion gas supply line outside the gas analyzer as well as the combustion gas path in the gas analyzer must be checked regularly, refer to **Check the integrity of combustion gas path** on page 60.
- A shut-off valve must be installed in the combustion gas supply line to increase safety in the following operating conditions, refer to **Shut-off valve in the combustion gas supply line** on page 23:
  - when shutting down the gas analyzer,
  - in case of instrument air supply failure,
  - in case of a leak in the combustion gas path, inside the gas analyzer.
 This shut-off valve should be installed outside the analyzer house in the vicinity of the combustion gas supply (cylinder, line).
- Should the combustion gas supply to the analyzer module not shut off automatically in the event of an instrument air supply failure, an alarm that is visible or audible to the operator must be triggered, refer to **"Diagnosis / error messages" in the operating instruction**.

## ... 2 Use in potentially explosive atmospheres

### ... Installation of the gas analyzer and the gas connections

#### Connecting the sample gas line

- No sample gas line with temperatures exceeding 130 °C may be connected to the sample gas input of the analyzer. Otherwise, Temperature Class T3 cannot be safely guaranteed, resulting in operation of the sample gas shut-off valve outside of the recommended specifications.
- When measuring combustion gases, it must be ensured that if either the instrument air supply or the analyzer module should fail, the sample gas supply to the analyzer module will be shut off and the sample gas path purged with nitrogen.
- When connecting zero and test gas, the operator must ensure that no explosive gas mixture is introduced into the analyzer at any point (e.g. due to residues of combustion gas components from the process gas in the sample gas line). For this reason, oxidizers such as atmospheric oxygen in zero and test gas should be avoided.
- If it is not possible to avoid the use of explosive gas mixtures temporarily, the operator must ensure reliable prevention of potential ignition in the exhaust pipe or re-ignition in the sample/testing or process gas supply. This can be accomplished by using additional flame arresters/detonation tube fuses, for example.

#### Electrical connections

The following requirements and conditions must be observed for the electrical connection of the gas analyzer.

#### Purging and monitoring unit FS870S

- To guarantee the IP 65 housing protection for the purging and monitoring unit FS870S observe the following points:
  - The cables must be inserted into the cable glands properly and sealed by tightening the screws.
  - All unused cable glands and gas connections must be sealed with suited sealing plugs.
  - Further measures may have to be taken for both the outlet vent and the pressure equalization vent. For this purpose, the information in the relevant operating instruction for the FS870S purging and monitoring unit must be observed.
- For the electrical connection of the purging and monitoring unit, the operating instruction for the FS870S purging and monitoring unit must also be observed.

#### Requirements for the Models II 2G/Gb and II 2D/Db

- For Zone 1 installations, all connecting lines on the operator's side, which could remain live after switching off the power supply or failure of the pressurized encapsulation, must be routed via an interface cut-off relay. The interface cut-off relay must be controlled by the purging and monitoring unit and, in the event of a fault, it must disconnect all the poles of the relevant connection lines. Refer to **Connecting the interface relay** on page 50.

## Commissioning

The following requirements and conditions must be observed when commissioning the gas analyzer.

### Purging and monitoring unit

- The operator should adjust the PIN codes specified for the configuration of the purging and monitoring unit, in order to prevent unauthorized persons from making changes to the configuration, refer to **PIN codes and purging parameters** on page 54.

### Requirements for the Models II 3D/Dc and II 2D/Db

The operator must ensure that the inside of the housing is cleaned of dust before the gas analyzer is switched on.

The initial purging of the housing is not intended for the purpose of cleaning the housing!

## Operation

The following requirements and conditions must be observed when operating the gas analyzer:

- Cables have to be properly inserted in the screwed cable glands and sealed by screwing the nut firmly,
- The housing may not be opened while the power is switched on. If any work is needed to be performed on the analyzer during operation, with the housing open, a fire certificate must be provided. The operator must ensure that, if the gas analyzer is shut down,
  - the sample gas path is purged with pressurized air or an inert gas,
  - the combustion gas supply is switched off,
  - and the analyzer is separated from the exhaust gas (otherwise, any excess pressure in the exhaust manifold could contaminate the analyzer or leakage could lead to an unintended release).
- Before opening the housing in an Ex atmosphere, the operator must wait at least 20 minutes after switching off the power supply, in order to ensure that all internal components have cooled down safely, to below 195 °C (Temperature Class T3).

## Maintenance

The following requirements and conditions must be observed when maintaining the gas analyzer.

### Maintenance activities

- The housing may not be opened while the power is switched on. If any work is needed to be performed on the analyzer during operation, with the housing open, a fire certificate must be provided.  
The operator must ensure that the following steps are implemented if the gas analyzer is shut down:
  - Purge the sample gas path with pressurized air or inert gas before shutting down.
  - Switch off the combustion gas supply.
  - Disconnect the analyzer from the exhaust gas (otherwise, any excess pressure in the exhaust manifold could contaminate the analyzer or leakage could lead to an unintended release).
- The operator is obliged to carry out the following controls on the gas analyzer at regular intervals, at least once a year and whenever any work is carried out on the gas lines:
  - Leak tightness test in accordance with **Checking gas path leak tightness** on page 60 and **Check the integrity of combustion gas path** on page 60.
  - A functionality test of the purging and monitoring unit FS870S, pursuant to Operating instruction.
  - A functionality test of the pressure switch, for the monitoring of the minimum input pressure of the injector pump, pursuant to Operating instruction.

### Cleaning models II 3G/Gb and II 2G/Gb

- The housing must be protected against brush discharges or electrostatic charging; the housing may only be cleaned with a moist cloth.

### Replacing the backup battery

- The system controller has a backup battery to retain the date and time settings in the case of a power cut. This battery may only be replaced with the original battery type:
  - Varta CR 2032 Type No. 6032 or
  - Renata Type No. CR2032 MFR
- Battery replacement in accordance with Operating instruction.

### 3 Design and function

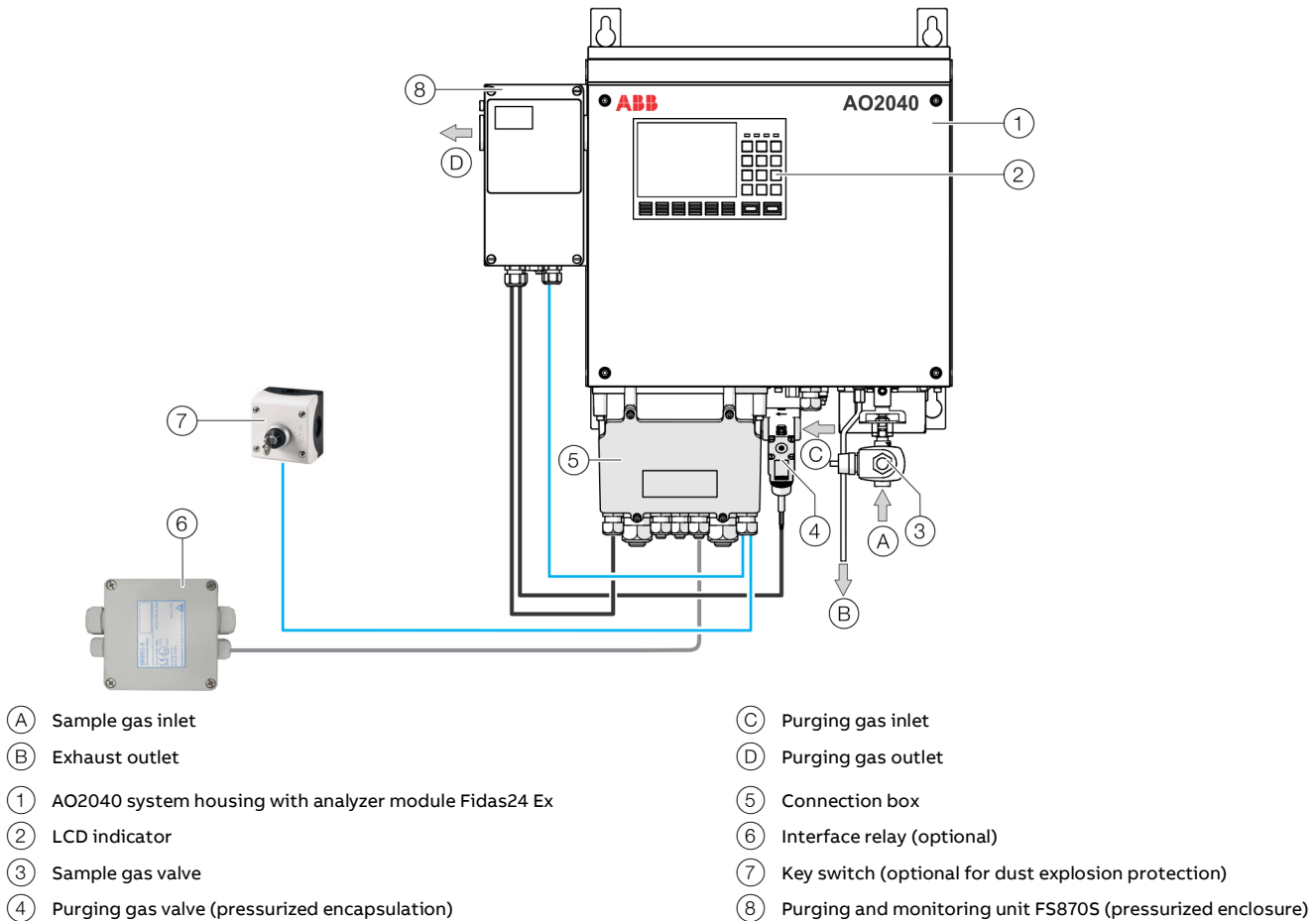


Image 1: Components (example)

#### Design

The gas analyzer AO2040-Fidas24 Ex consists of the AO2040 system housing with a Fidas24 analyzer module and an IP Protection Class IP 65 connecting box.

The housing forms a pressurized encapsulation, together with the purging and monitoring unit FS870S and the associated purging gas valve, in accordance with the IEC 60079-2 standard.

Compressed air is used as the purging gas. It safely separates the potentially explosive ambient atmosphere from the analyzer module.

Various models of the AO2040-Fidas24 Ex are available, refer to **Ex marking and versions** on page 7  
 Only the schematic structure differs between the Category 3G/2G and 3D/2D versions.

#### Safety features

##### Purging and monitoring unit

The purging and monitoring unit ensures continual purging of the analyzer housing, in order to dilute potential leakages within the housing, and also maintains gauge pressure within the housing to securely prevent the ingress of the surrounding Ex atmosphere.

Therefore, the interior of the gas analyzer housing is not assigned to any explosion protection zone. No explosive gas mixture can escape to the outside from the interior of the housing.

The purging and monitoring unit monitors the pressurization of 2 hPa within the housing and disconnects the gas analyzer from the power supply if the pressure falls below the minimum pressurization, or if an external alarm (pressure switch/key switch) is triggered.

**Pressure switch for monitoring the instrument air**

The internal pressure switch monitors the supply of instrument air to the analyzer and disconnects the analyzer from the power supply if the instrument air supply (supply pressure < 3 bar (rel.)) fails.

Therefore, the pressure switch is connected to the purging and monitoring unit via an intrinsically safe line with the input "ext. Alarm".

**Sample gas valve**

The sample gas valve interrupts the flow of sample gas to the analyzer when it is switched off, and when the sensor temperature is too low (e.g. during the warm-up phase).

**Containment system**

The gas paths that come into contact with the combustion and sample gas are designed in the form of a containment system, in accordance with the IEC 60079-2 standard.

The flow of combustion gas into the containment system is limited to a maximum volume flow rate of 10 l/h H<sub>2</sub> by means of an integrated flow limiter.

The pressurized section of the containment system (combustion gas path to the first nozzle) is designed as a limited-release containment system, and the remaining section of the containment system is designed as a non-release containment system, due to the monitoring of the negative pressure control.

**Options****Note**

The optional key switch and interface relay must be approved for use in the corresponding explosion protection zone.

**Key switch**

In the version for Category 2D/3D, the optional key switch is required for acknowledgement of the internal cleaning of the housing before commissioning.

Therefore, the key switch is connected to the purging and monitoring unit via an intrinsically safe line with the input "ext. Alarm".

**Interface relay**

In the design for category 2G / 2D, the optional interface relay is used for isolating all of the poles on the operator's side (e.g. bus systems) which could remain live when the analyzer is disconnected from the power supply (e.g. due to a separate power supply).

## 4 Product identification

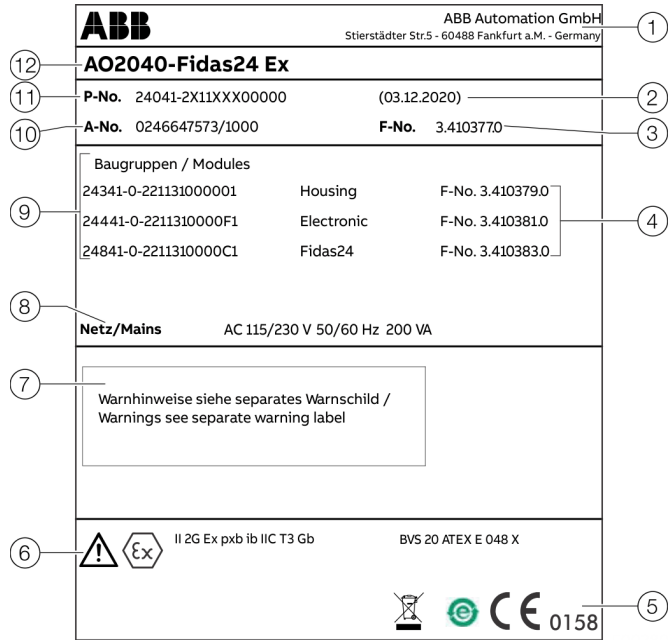
### Name plate

**Note**

The name plates displayed are examples. The device identification plates affixed to the device can differ from this representation.

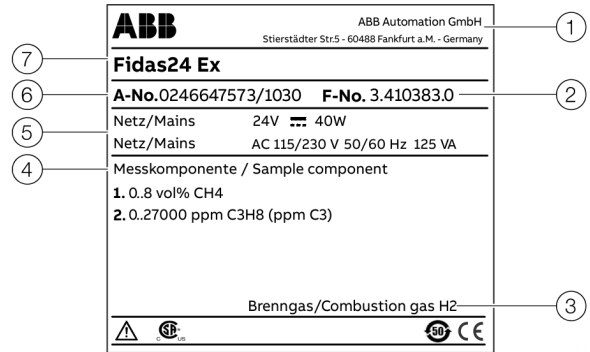
The gas analyzer has several name plates:

- The gas analyzer name plate is located on the exterior of the side wall of the system housing.
- The name plate of the Fidas24 Ex analyzer module is located on the exterior of the terminal board.



- |   |  |
|---|--|
| ① Manufacturer, address                           | ⑦ Reference to additional warning sign |
| ② Manufacture date                                | ⑧ Power supply                         |
| ③ Serial Number (gas analyzer)                    | ⑨ Order numbers (sub-assemblies)       |
| ④ Serial Numbers (sub-assemblies)                 | ⑩ Order number                         |
| ⑤ CE marking                                      | ⑪ Order number (gas analyzer)          |
| ⑥ Ex marking, type examination certificate number | ⑫ Model name number                    |

Image 2: Name plate, gas analyzer (example)



- |                                   |                     |
|-----------------------------------|---------------------|
| ① Manufacturer, address           | ④ Sample components |
| ② Serial number (analyzer module) | ⑤ Power supply      |
| ③ Combustion gas                  | ⑥ Order number      |
|                                   | ⑦ Model designation |

Figure 3: Analyzer module name plate (example)

### Plates and symbols

**Note**

- All pictograms, signs and labels attached to the device must be complied with and maintained in a clearly legible state.
- Damaged or illegible pictograms, signs and inscriptions must be replaced.

The signs and symbols listed below are attached to the unit.

| Sign/Symbol | Position/Meaning   |
|-------------|--|
|             | <b>Junction box</b><br>Warning against dangerous electrical voltage. |



### Warning sign regarding protection against explosions

The warning sign for protection against explosions is located on the side wall of the system housing.

| WARNINGS |   |   |
|----------|---|---|
| ①        | Pressurized Enclosure / Überdruckgekapseltes Gehäuse  |   |
| ②        | WARNING: Do not open when explosive atmosphere is present / WARNUNG: Nicht öffnen, wenn eine explosionsfähige Atmosphäre vorhanden ist.   |   |
| ③        | After De-Energizing, delay 20 Minutes before Opening / Vor Öffnen Spannung abschalten und 20 Minuten warten   |   |
| ④        | Enclosure has to be protected against brush discharges and electrostatic charges; Clean with moist cloth only / Gehäuse ist vor Büschelentladung bzw. elektrostatischer Aufladung zu schützen; nur mit feuchtem Tuch reinigen |   |
| ⑤        | All plastic and elastomer parts as part of the housing must be protected from UV radiation / Sämtliche gehäusewirksame Kunststoff- und Elastomerteile müssen vor UV-Strahlung geschützt werden.                               |   |
| ⑥        | Protective gas supply / Zündschutzgasversorgung   | Air / Luft<br>$p_a = 4000 \pm 500$ hPa<br>$T = -20..40^\circ\text{C}$ |
| ⑦        | Time of pre-purge / Vorspüldauer  | > 235 s   |
| ⑧        | Flow rate during pre-purge / Durchflussrate Zündschutzgas für Vorspülung  | 1 l/s   |
| ⑨        | Flow rate during normal operation / Durchflussrate Zündschutzgas im Betrieb   | 1080 l/h  |
| ⑩        | Overpressure range of purging / Überdruckregelbereich Zündschutzgas:  | 0,8..15 hPa   |
| ⑪        | <b>Containment System</b><br>max. pressure / max. Druck Hydrogen H <sub>2</sub><br>max. flow rate of H <sub>2</sub> into containment system / max. Durchflussrate H <sub>2</sub> in das "Containment System":                 | $p_a = 1200 \pm 100$ hPa<br>10 l/h                                    |

- ① Pressurized-encapsulated housing
- ② WARNING: Do not open in a potentially explosive atmosphere.
- ③ Switch off power and wait 20 minutes before opening.
- ④ Protect the housing from brush discharge or electrostatic charging; clean only with a moist cloth.
- ⑤ All of the plastic and elastomer components of the housing must be protected against UV radiation.
- ⑥ Data for the inert gas supply, refer to page 22.
- ⑦ Duration of initial purging
- ⑧ Flow rate of the inert gas for initial purging
- ⑨ Flow rate of the inert gas during operation
- ⑩ Pressurized control range, inert gas,
- ⑪ max. pressure hydrogen H<sub>2</sub>; max. flow rate H<sub>2</sub> within the "Containment System", refer to page 23.

Image 4: Warning sign for Category 3G/2G

| WARNINGS |  |   |
|----------|--|---|
| ①        | Pressurized Enclosure / Überdruckgekapseltes Gehäuse   |   |
| ②        | WARNING: Do not open when explosive atmosphere is present / WARNUNG: Nicht öffnen, wenn eine explosionsfähige Atmosphäre vorhanden ist.  |   |
| ③        | After De-Energizing, delay 20 Minutes before Opening / Vor Öffnen Spannung abschalten und 20 Minuten warten  |   |
| ④        | WARNING: Remove all dust from the inside of the enclosure before connecting or restoring the electrical supply / WARNUNG: Vor dem Einschalten Gehäuse von Staub reinigen   |   |
| ⑤        | For protection type dust a certified key switch has to be installed (see user manual) / In der Staub-Ex Ausführung muss ein zugelassener Schüsselschalter installiert werden (siehe Betriebsanleitung)           |   |
| ⑥        | WARNING: For protection type dust an increase of the zone classification has to be considered due to purge gas outlet / WARNUNG: Bei Staub-Ex Zonenerhöhung durch Verwirbelungen am Zündschutzgasausgang möglich |   |
| ⑦        | Must not be operated in areas with increased risk of static charging / Nicht in Bereichen mit erhöhter Aufladungsgefahr aufstellen   |   |
| ⑧        | All plastic and elastomer parts as a part of the housing must be protected from UV radiation / Sämtliche gehäusewirksame Kunststoff- und Elastomerteile müssen vor UV-Strahlung geschützt werden.                |   |
| ⑨        | Protective gas supply / Zündschutzgasversorgung  | Air / Luft<br>$p_a = 4000 \pm 500$ hPa<br>$T = -20..40^\circ\text{C}$ |
| ⑩        | Time of pre-purge / Vorspüldauer   | > 235 s   |
| ⑪        | Flow rate during pre-purge / Durchflussrate Zündschutzgas für Vorspülung   | 1 l/s   |
| ⑫        | Flow rate during normal operation / Durchflussrate Zündschutzgas im Betrieb  | 1080 l/h  |
| ⑬        | Overpressure range of purging / Überdruckregelbereich Zündschutzgas:   | 0,8..15 hPa   |
| ⑭        | <b>Containment System</b><br>max. pressure / max. Druck Hydrogen H <sub>2</sub><br>max. flow rate of H <sub>2</sub> into containment system / max. Durchflussrate H <sub>2</sub> in das "Containment System":    | $p_a = 1200 \pm 100$ hPa<br>10 l/h                                    |

- ① Pressurized-encapsulated housing
- ② WARNING: Do not open in a potentially explosive atmosphere.
- ③ Switch off power and wait 20 minutes before opening.
- ④ WARNING: Remove all dust from the housing before switching on.
- ⑤ For the Dust-Ex version, an approved key switch must be installed (refer to operating instructions)
- ⑥ WARNING: In the case of the Dust-Ex, zone elevation is possible due to turbulence at the inert gas outlet.
- ⑦ Do not install in areas with increased risk of electrostatic charging
- ⑧ All of the plastic and elastomer components of the housing must be protected against UV radiation.
- ⑨ Data for the inert gas supply, refer to page 22.
- ⑩ Duration of initial purging
- ⑪ Flow rate of the inert gas for initial purging
- ⑫ Flow rate of the inert gas during operation
- ⑬ Pressurized control range, inert gas,
- ⑭ max. pressure hydrogen H<sub>2</sub>; max. flow rate H<sub>2</sub> within the "Containment System", refer to page 23.

Image 5: Warning sign for Category 3D/2D

## ... 4 Product identification

### Scope of delivery

- Gas analyzer model AO2040-Fidas24 Ex (wall-mounted housing)
- Screwed fittings with tubing connectors for the connection of flexible tubes
- Counter plug (socket housing) for the electrical connection of the I/O modules (plugged into the I/O module connections)
- Screwdriver (required for attaching the electric lines in the counter plugs)
- Accessory bag with fittings and O-rings for the connection of the sample gas lines
- Exhaust air pipe with connecting nut and locking ring
- Commissioning Instruction
- Analyzer data sheet

### Analyzer data sheet

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

### Storage of the Analyzer Data Sheet

- on the left-hand side panel inside the 19"-housing (model EL3020) and
- on the door glued inside the wall-mount housing (model EL3040).

### Note

- Keep the analyzer data sheet in the gas analyzer so that it is always at hand, especially in case of service/maintenance, refer to **Service address** on page 6.
- During commissioning, observe the information in the analyzer data sheet. The information given in the analyzer data sheet may differ from the general information in this regard Commissioning Instruction.

## Optional accessories

The following components are available as accessories.

| Component                               | Order no.       |
|---|-----------------|
| Interface relay                         | 3KXG758045U0100 |
| Key switch                              | 3KXG758072U0100 |
| Pneumatic combustion gas shut-off valve | 769440          |
| Calibration gas valve                   | 3KXG758053U0100 |

## 5 Transport and storage

### Safety instructions

#### CAUTION

##### Injury hazard due to heavy weight

The gas analyzer weighs approx. 30 kg!

- Two persons are required for unpacking and transportation!

### Inspection

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.

### Transporting the device

Observe the following instructions:

- Do not expose the device to humidity during transport. Pack the device accordingly.
- Pack the device so that it is protected against vibrations during transport, for example, by using air-cushioned packing.

### Storing the device

Bear the following points in mind when storing devices:

- Store the device in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Avoid storing the device in direct sunlight.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

### Ambient conditions

Transport-/Storage temperature

-25 to 65 °C

### Packaging

1. If the original packing material is no longer available, wrap the device in bubble foil or corrugated cardboard. When shipping overseas, also heat-seal the device air-tight in 0.2 mm thick polyethylene, including a desiccant (e.g. silica gel). The amount of desiccant used should be adequate for the package volume and the probable shipping time (at least 3 months).
2. Pack the device in an adequately large box lined with shock absorbent material (e.g. foam material). The thickness of the cushioning material should be adequate for the weight of the device and the mode of shipping. The box should also be lined with a double layer of bitumen paper for overseas shipping.
3. Mark the box 'Fragile! Handle with care!'.

### 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 74) 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 Automation GmbH**

**Service Analysetechnik – Parts & Repair**

Stierstädter Straße 5

60488 Frankfurt, Deutschland

Fax: +49 69 7930-4628

E-Mail: [repair-analytical@de.abb.com](mailto:repair-analytical@de.abb.com)

[www.abb.de/prozessautomatisierung-service](http://www.abb.de/prozessautomatisierung-service)

## 6 Preparation for Installation

### Material required for installation

#### Note

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

#### Gas connections on the device

Metal screw-in fittings with 1/8-NPT thread and PTFE sealing tape.

#### Gas lines

##### Process gases, test gases and waste air

- Combustion gas, combustion air:  
PTFE or stainless steel pipes with an inner diameter of 4 mm
- Purging gas, instrument air:  
PTFE or stainless steel pipes with an inner diameter of 6 mm
- Exhaust air:  
PTFE or stainless steel pipes with an inner diameter  $\geq 10$  mm
- Tube fittings
- Pressure regulator
- Automatic combustion gas shut-off valve, refer to **Shut-off valve in the combustion gas supply line** on page 23.

#### Sample gas

Heated sample gas line (recommended: TBL 01) or unheated sample gas line (PTFE or stainless steel tube with inner- / outer diameter 4 / 6 mm) set to a maximum of 130 °C.

The fittings and O-rings required for connection are included within the scope of delivery of the gas analyzer.

#### Installation Material

##### Wall-mount housing

- 4 screws M8 or M10
- Fastening materials suitable for the respective mounting surface (wall plugs etc.)

#### Signal Lines

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

Notes concerning the cable cross-section for connection of the I/O modules:

- The maximum capacity of terminals for stranded or solid conductors is 1 mm<sup>2</sup> (17 AWG).
- The stranded conductor may be tinned on the tip or twisted for simplified connection.
- When using wire end ferrules the total section must not exceed 1 mm<sup>2</sup>, i.e. the maximum stranded conductor section cannot be greater than 0.5 mm<sup>2</sup>. The Weidmüller PZ 6/5 crimping tool must be used for crimping the ferrules.

#### Lengths and types of cables for the RS485 lines

- Maximum 1,200 m (transfer rate, maximum 19,200 bit/s).
- Three-core twisted-pair cable, conductor cross section 0.25 mm<sup>2</sup> (e.g. order number 746620)

#### Length of the RS232 lines

Maximum 15 m.

#### Mating connector (socket housing)

The required mating connector (socket housing) for the plug-in terminal strips on the I/O modules is included in the scope of delivery.

#### Power supply

- Select conductive material which is appropriate for the length of the lines and the predictable current load.
- A mains separation device must be provided in order to enable all poles of the gas analyzer, including the purging and monitoring unit, to be disconnected from the power supply if necessary.
- The power supply cable is connected to the corresponding terminals of the purging and monitoring unit, refer to **Connecting the power supply** on page 51.

## Requirements for the installation site

### Installation location

#### **DANGER**

##### Explosion hazard

Risk of explosion due to electrostatic charging of the gas analyzer housing.

- The gas analyzer must not be installed in an area where process-related electrostatic charging of the housing could occur (e.g. near filling systems).

### Note

When using the device in potentially explosive atmospheres, note the additional information in **Installation** on page 11!

- The gas analyzer is intended for indoor installation only.
- The mounting surface must be sufficiently stable to support the weight of the gas analyzer!
- All the components of the analyzer housing that made of plastic and elastomers must be protected against UV radiation (e.g. sunlight).

### Installation location altitude

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

### Short gas paths

The following points must be observed when installing the gas lines:

- Install the gas analyzer as close to the measuring point as possible.
- Install the modules for gas conditioning and calibration as close to the gas analyzer as possible.
- Keep the gas lines for the purging and instrument air as short as possible, and ensure that the inside diameters are sufficient ( $\geq 6$  mm).
- The pressure reducer for the purging and instrument air must be designed for the maximum volume flow during the initial purging phase (4000 l/h).

### Adequate air circulation

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

The complete surface of the system housing is used to dissipate the heat losses.

### Protection from adverse ambient conditions

Protect the gas analyzer from the following influences:

- Cold,
- Exposure to heat from e.g. the sun, furnaces, boilers,
- Temperature variations,
- Strong air currents,
- Accumulation of dust and ingress of dust,
- Corrosive atmosphere,
- Vibration.

### Climatic Conditions

#### Relative humidity

Maximum 75 %, no condensation

#### Ambient temperature during operation

5 to 45 °C (41 to 113 °F)

#### Transport-/Storage temperature

-25 to 65 °C

### Housing protection (IP rating)

IP 65

### Vibrations/shocks

#### AO2040-Fidas24 Ex

Maximum 0.5 g, maximum 150 Hz

## ... 6 Preparation for Installation

### Fidas24

#### Sample gas

##### Flammable sample gases

### DANGER

#### Explosion hazard

Explosion hazards due to flammable sample gases with a C1-equivalent of  $\geq 8$  Vol-%  $\text{CH}_4$ .

- The flammable sample gas that is fed in must have the following specifications:

#### Sample gas specifications

- The sample gas that is fed in must at no time, exceed the C1-equivalent of 8 Vol-%  $\text{CH}_4$ .
- The sample gas that is fed in must not be potentially explosive.
- The specifications must also be adhered to during the start-up and shut-down processes, and the pressure, temperature and gas matrix must be taken into account.

#### Note



An explosive mixture of gases is defined as a mixture containing combustion components, that falls within the lower (UEG) and upper explosion limits (OEG), which is accompanied by the simultaneous presence of oxidizers (e.g. air, oxygen).

#### Sample gas inlet conditions

| Parameter                       | Value/Description  |
|---------------------------------|--|
| Temperature                     | $\leq 130$ °C<br>(also applies in the case of heated sample gas lines) |
| Inlet pressure $p_{\text{abs}}$ | 800 to 1100 hPa  |
| Flow rate                       | Approx. 80 to 100 l/h<br>at atmospheric pressure (1000 hPa)            |
| Humidity                        | $\leq 40$ % $\text{H}_2\text{O}$                                       |

#### Note

The temperature, pressure and flow of the sample gas must be kept constant, to such an extent that the influence of variations on the measuring accuracy is acceptable, refer to **Specification** on page 73.

#### Requirements for the sample gas outlet

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

#### Further properties of the sample gas

The analyzer module must not be used for the measurement of gases containing organometallic compounds, e.g. lead-containing fuel additives or silicone oils.

#### Operational gases

##### Properties of the instrument air

| Parameter            | Value/Description  |
|----------------------|--|
| Quality              | According to ISO 8573-1 Class 2<br>Particle size: max. 1 $\mu\text{m}$ ,<br>Particle density: max. 1 $\text{mg}/\text{m}^3$ ,<br>Oil content: max. 0.1 $\text{mg}/\text{m}^3$ ,<br>Dew point: At least 10 °C below the lowest expected ambient temperature |
| Inlet pressure $p_e$ | 4000 hPa, $\pm 500$ hPa  |
| Temperature          | Maximum 40 °C  |
| Flow rate            | Typically approx. 1200 l/h, refer also to <b>Purge gas flow</b> on page 24.  |

#### Purging gas properties for pressurized enclosure (FS870S) (in the case of separate supply)

| Parameter            | Value/Description                            |
|----------------------|--|
| Quality              | Class 533, in accordance with DIN ISO 8573-1 |
| Inlet pressure $p_e$ | 4000 hPa, $\pm 500$ hPa                      |
| Temperature          | Maximum 40 °C                                |
| Flow rate            | Refer to <b>Purge gas flow</b> on page 24.   |

#### Note

When using the instrument air of the Fidas24 as purging gas for the pressurized enclosure, the quality specified in the top table applies.

### Combustion air

| Parameter            | Value/Description   |
|----------------------|---|
| Quality              | <ul style="list-style-type: none"> <li>Synthetic air or catalytically purified air</li> <li>Organic hydrocarbon content: &lt; 1 % of the measuring range</li> </ul> |
| Inlet pressure $p_e$ | 1200 hPa, $\pm 100$ hPa   |
| Flow rate            | < 20 l/h  |

### Combustion gas

#### Combustion gas parameter

|                           |   |
|---------------------------|---|
| Quality                   | Hydrogen (H <sub>2</sub> ), Quality 5.0 |
| Inlet pressure $p_e$      | 1200 hPa, $\pm 100$ hPa                 |
| Combustion gas flow rate* | Typical $\leq 3$ l/h, maximum 10 l/h    |

\* The combustion gas flow is limited to a maximum of 10 l/h H<sub>2</sub> by an integrated flow limiter.

#### Note

The safety valve installed in the analyzer closes safely up to a combustion gas pressure of 6 bar.

The operator must take suitable measures to prevent the occurrence of higher pressures at the combustion gas inlet.

#### Shut-off valve in the combustion gas supply line

In order to increase the safety level under the following operational conditions, a pneumatic shut-off valve must be installed in the combustion gas supply line:

- when shutting down the gas analyzer,
- in case of instrument air supply failure,
- in case of a leak in the combustion gas path, inside the gas analyzer.

The pneumatic shut-off valve automatically interrupts the combustion gas supply if the instrument air supply pressure falls below 3 bar (abs.).

The pneumatic shut-off valve should be installed outside the analyzer house near the combustion gas supply.

ABB recommends the use of a pneumatic shut-off valve that is actuated by the instrument air. This shut-off valve can be supplied by ABB.

Order number 0769440.

### Test gases

#### DANGER

##### Explosion hazard

Explosion hazard when using air as the zero point gas. Due to the oxygen contained in the air, there is a risk that a potentially explosive atmosphere could develop through back-purging during the process.

- Ensure that the zero point gas cannot flow back into the process:
  - Separation of the test gas supply from the process by means of a shut-off valve
  - Discharge of the excess test gas into an extraction or exhaust gas collection pipe.

#### Test Gases for Zero Calibration

|                      |  |
|----------------------|--|
| Quality              | <ul style="list-style-type: none"> <li>Nitrogen, quality 5.0; synthetic or catalytically purified air</li> <li>Organic hydrocarbon content of &lt; 1 % of the measuring range</li> </ul> |
| Inlet pressure $p_e$ | Without pressure and in excess or at least 130 l/h   |
| Flow rate            | 130 to 250 l/h   |

#### Test gases for endpoint calibration

|                      |  |
|----------------------|--|
| Quality              | Sample component or substitute gas component in nitrogen or synthetic air with concentration adjusted to the measuring range |
| Inlet pressure $p_e$ | Without pressure and in excess or at least 130 l/h   |
| Flow rate            | 130 to 250 l/h   |

#### Note

The calibration information under **Calibration** in the operating instruction must be taken into account.

#### Gas connections

Refer to **Position and design of the gas connections** on page 29.

## ... 6 Preparation for Installation

### Instrument air and purging gas supply

In the case of AO2040-Fidas24 Ex a differentiation is made between instrument air and purging gas:

- **Instrument air:**  
The instrument air is used as propulsion air for the air jet injector of the analyzer module.
- **Purging gas:**  
The purging gas is used to supply the pressurized enclosure of the system housing.

Each connection has its own separate connection point:

- **Instrument air:**  
The instrument air supply is connected to the respective connection of the analyzer module.
- **Purging gas:**  
The purging gas supply is connected to the purging gas valve of the system housing.

Depending on the quality, for AO2040-Fidas24 Ex the supply of instrument gas and purging gas can be provided in two different ways:

- **Separate supply:**  
Instrument gas and purging gas supply from two separate sources.
- **Common supply:**  
Instrument gas and purging gas supply from a common source. The characteristics of the instrument air supply apply here!

The necessary pipes and hoses must be provided by the customer.

### Pressurized encapsulation Ex-p

#### Purging and monitoring unit FS870S

The purging and monitoring unit ensures continual purging of the analyzer housing, in order to dilute potential leaks within the housing.

The purging and monitoring unit monitors the pressurization of 2 hPa within the housing and disconnects the gas analyzer from the power supply if the pressure falls below the minimum pressurization, or if an external alarm (pressure switch/key switch) is triggered. Initial purging is then restarted.

#### Purge gas flow

#### **DANGER**

##### Explosion hazard

Danger of explosion if purging of the housing is deactivated or if the purging parameters are changed.

- The purging of the housing must not be deactivated in hazardous areas.
- The ex-works preset rinsing parameters must not be changed under any circumstances.

#### **NOTE**

##### Loss of explosion protection approval

Loss of explosion protection approval, due to changes to the purging parameters that have been preset at the factory.

- The ex-works preset rinsing parameters must not be changed under any circumstances.

#### Note

The parameterization of the purging and monitoring unit is protected by PIN codes.

During commissioning, the PIN codes must be changed and documented by the operator. This ensures that only authorized persons are granted access to the parameterization of the purging and monitoring unit.



**Note regarding the purging air supply**

Long supply lines with small diameters can result in incorrect functioning of the pressurized control of the purging and monitoring unit FS870S.

The following points should be observed when configuring the purging air supply:

- The chosen pressure reducer must be able to supply not only the working pressure but also the corresponding volume flow of 4,000 l/h
- Long supply lines should be avoided in general, and the inner diameter of the supply lines should be at least 6 mm, or for longer lengths, even larger.
- Keep the distance between the pressure reducer of the purging air supply and the gas analyzer as short as possible.

**Initial purge**

The purging gas flow rate and the duration of the purging process for the purging and monitoring unit FS870S are preset at the factory.

| Parameter                                    | Factory setting  |
|--|------------------|
| Initial purge volumes                        | 250 l            |
| Purging gas flow rate during initial purging | 3600 l/h (1 l/s) |

**During operation**

The purging gas flow rate and the pressurized control range of the purging and monitoring unit FS870S are pre-programmed at the factory.

| Parameter                            | Factory setting |
|--------------------------------------|-----------------|
| Purge Gas Flow Rate during Operation | 1080 l/h        |
| Monitored pressurized control range  | 0.8 to 15 hPa   |

**Power supply**

The power supply of the gas analyzer is provided via the purging and monitoring unit FS870S. The cold-device cable of the gas analyzer is already permanently connected to the purging and monitoring unit FS870S at the factory.

The power supply cable is connected to the corresponding terminals of the purging and monitoring unit, refer to **Purging and monitoring unit FS870S** on page 48.

**Electrical data for the power supply**

The power supply unit built into the system housing is used to supply the 24 V DC to the Fidas24 Ex module and the associated electronics with DC energy.

**Power supply (entire device)**

|                                   |   |
|-----------------------------------|---|
| Input voltage                     | 110 to 230 V AC, $\pm 10\%$   |
| Input Current                     | Maximum 2.5 A   |
| Line Frequency Range              | 50 to 60 Hz, $\pm 3$ Hz   |
| Power consumption (entire device) | Maximum 200 VA  |
| Output Voltage                    | 24 V DC, $\pm 3\%$<br>(for optional cut-off relay control)  |
| Connection                        | At the corresponding terminals of the purging and monitoring unit, refer to <b>Connections for power supply on the FS870S purging and monitoring unit</b> on page 48. |

**Battery****Application**

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

**Type**

Lithium button cell 3 V CR 2032

**Note**

Only the original battery type may be used as a replacement:

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

## ... 6 Preparation for Installation

### Key switch

For the Category 3D/2D (Dc/Db) versions, an additional key switch must be installed by the operator.

The key switch is used to confirm the internal cleaning of the housing before commissioning (removal of dust deposits), and to enable purging of the housing.

The key switch must be installed close to the gas analyzer and clearly labeled as belonging to the gas analyzer.

The key switch is connected to the intrinsically safe line after preinstalled at the factory. The line is switched internally in series with the instrument air monitoring pressure switch and is connected to the 'Ext. Alarm' input of the purging and monitoring unit FS870S.

The key switch can be optionally ordered from ABB, for ordering information, see **Connecting the key switch** on page 49.

Alternatively, a suited key switch must be provided onsite by the operator.

#### Note

The optional key switch must be approved for use in the corresponding explosion protection zone.

### Cut-off relay for signal lines

In the design for category 2G / 2D, the following points must be observed:

- All signal lines which could still be live after switching off the power supply, or in the event of failure of the pressurized encapsulation, must be switched off at all poles, via a cut-off relay.
- Installation of the cut-off relay, refer to **Connecting the interface relay** on page 50.

The cut-off relay can be optionally ordered from ABB, for ordering information, see **Optional accessories** on page 18.

Alternatively, a suited cut-off relay must be provided onsite by the operator.

#### Note

The optional cut-off relay must be approved for use in the corresponding explosion protection zone.

## 7 Installation

### Safety instructions

#### **DANGER**

##### **Risk of explosion during installation and commissioning of the device**

There is no explosion protection during the installation and commissioning of the device or its components.

- Ensure that no potentially explosive atmosphere could arise during installation and commissioning.

### Unpacking the Gas Analyzer

#### **CAUTION**

##### **Injury hazard due to heavy weight**

The gas analyzer weighs approx. 30 kg!

- Two persons are required for unpacking and transportation!

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 18) 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.

## Dimensions

### Model AO2040-Fidas24 Ex

Dimensions in mm (in)

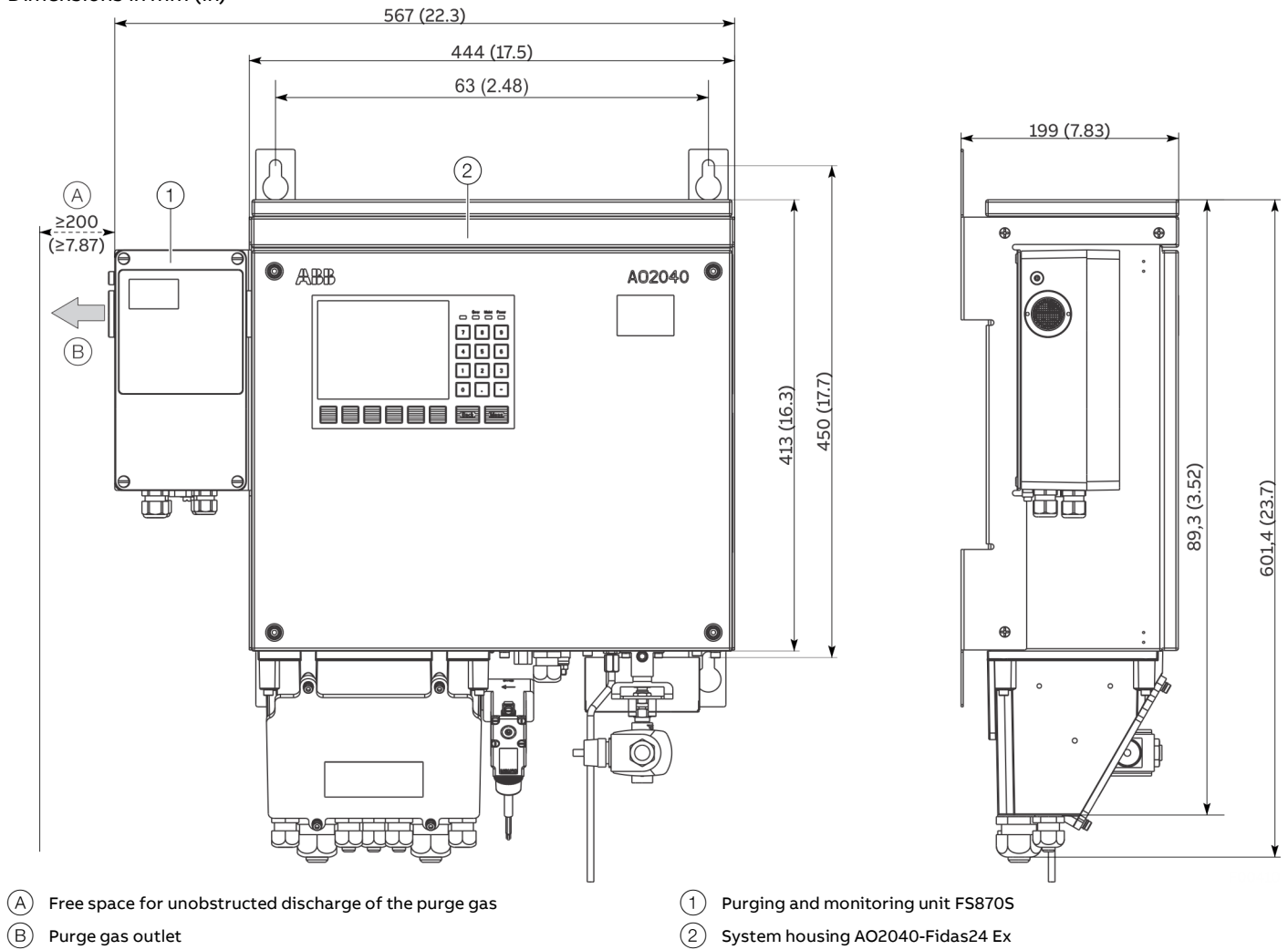


Figure 6: Dimensions, Model AO2040-Fidas24 Ex

## ... 7 Installation

### Mounting

#### Installation Material

##### Wall-mount housing

- 4 screws M8 or M10
- Fastening materials suitable for the respective mounting surface (wall plugs etc.)

#### Additional information

- The connection box shown in the dimensional drawings is flange-mounted to the housing.
- Adhere to the requirements at the installation site, refer to **Requirements for the installation site** on page 21.
- The air outlet of the purging and monitoring unit must not be blocked.
- Take into consideration the additional space required for the connecting lines (approx. 100 mm).
- When mounting the gas analyzer, take the space required for the heated sample gas lines into account (observe the minimum bending radius, according to manufacturer's specifications).
- When installing the wall-mounted housing, ensure that there is additional free space above the housing, as some modules are only accessible from the top (approx. 300 mm).
- Mount the wall-mounted housing in such a way that the LCD display is clearly visible.

#### Gas Analyzer Installation

##### **CAUTION**

##### **Injury hazard due to heavy weight**

The gas analyzer weighs approx. 30 kg!

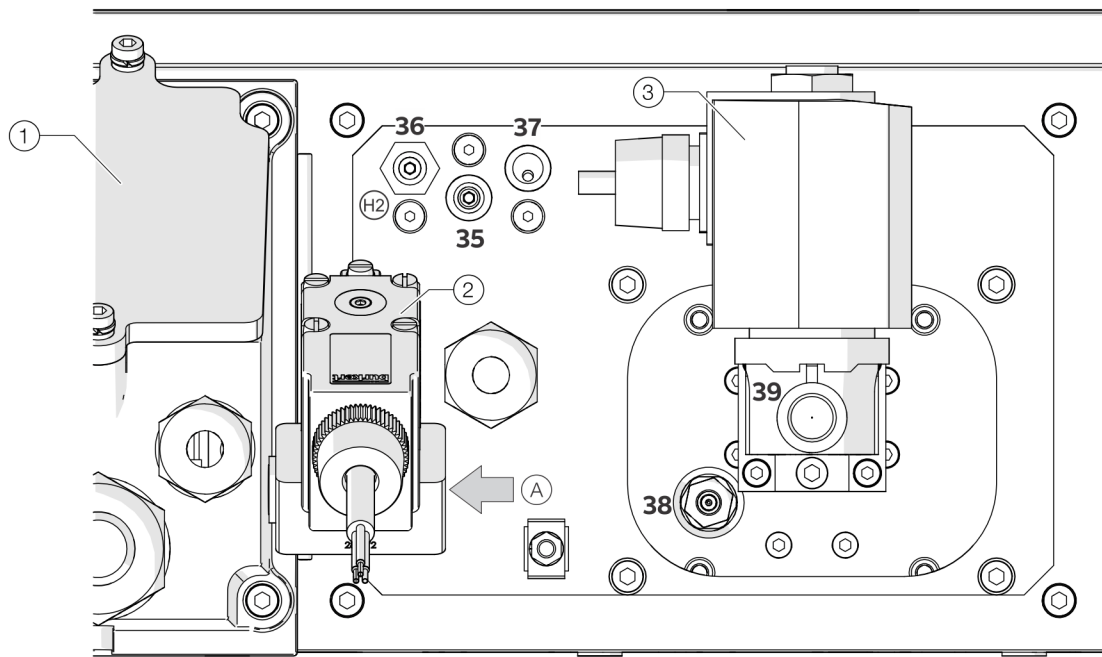
- Two persons are required for unpacking and transportation!

Mount the system housing on the wall with the fastening material of your choice.

Mounting hole distances, refer to **Dimensions** on page 27.

## Gas connections

### Position and design of the gas connections



- ① Connection box  
② Purging gas valve

- ③ Sample gas valve

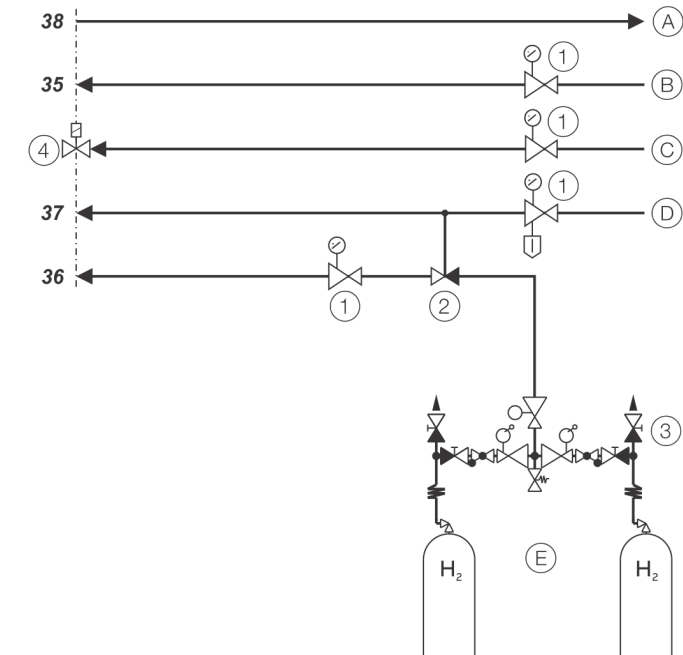
Figure 7: Position of the gas connections AO2040-Fidas14 Ex

| Pos. | Connection           | Supplementary information                                   | Design   |
|------|----------------------|---|--|
| 35   | Combustion air inlet | —   | 1/8" NPT female thread for threaded connections  |
| 36   | Combustion gas inlet | with pre-assembled flow restrictor                          | (not included in scope of supply)  |
| 37   | Instrument air inlet | —   |  |
| 38   | Exhaust outlet       | —   | Male thread for connection of the exhaust air pipe (stainless steel tube with an outside diameter of 10 mm, included in the scope of supply of the gas analyzer) |
| 39   | Sample gas inlet     | Connection options for heated or unheated sample gas lines. | G 1/4" NPT female thread for threaded connections (not included in scope of supply)  |
| Ⓐ    | Purging gas inlet    | Purging gas inlet for the pressurized enclosure Ex-p.       | G 3/8" NPT female thread for threaded connections (not included in scope of supply)  |

## ... 7 Installation

### ... Gas connections

#### Connection diagram for the operational gases



- |                                       |  |
|---------------------------------------|--|
| Ⓐ Exhaust air                         | ① Pressure reducer<br>(for fine pressure adjustment) |
| Ⓑ Combustion air                      | ② Pneumatic shutoff valve                            |
| Ⓒ Purging gas (pressurized enclosure) | ③ Switching station with safety valve                |
| Ⓓ Instrument air                      | ④ Purging gas valve                                  |
| Ⓔ Combustion gas                      |  |

Image 8: Connecting the operational gases

The numbering of the gas connections corresponds to the numbering in **Position and design of the gas connections** on page 29 as well as the labeling on the rear of the gas analyzer.

#### Connection diagram for the sample and test gases

### ⚠ DANGER

#### Explosion hazard

Explosion hazard when using air as the zero point gas. Due to the oxygen contained in the air, there is a risk that a potentially explosive atmosphere could develop through back-purging during the process.

- Ensure that the zero point gas cannot flow back into the process:
  - Separation of the test gas supply from the process by means of a shut-off valve
  - Discharge of the excess test gas into an extraction or exhaust gas collection pipe.

#### General

The sample gas connection (zero point and end point gas) is made via two external solenoid valves before the sample gas inlet valve. The solenoid valves are controlled by the gas analyzer during calibration.

Alternatively, the sample gas can also be supplied via appropriate manual valves. However, the possibility of automatic control of the valves during calibration is then no longer possible; the user has to open and close the valves manually.

The sample gas should be supplied in depressurized state (ambient pressure) at the sample gas inlet. To do this, the sample gas must be applied with an excess; this excess must be safely discharged.

Observe the following during commissioning:

- Sample gas supply without excess discharge is not permitted. It must be guaranteed that the sample gas pressure and flow rate at the sample gas inlet of the gas analyzer is constant.
- The negative pressure control of the gas analyzer cannot compensate for sample gas excess or sample gas deficiency. Fluctuations in sample gas supply can lead to calibration errors or the gas analyzer may fail.
- Pressure surges must be avoided when supplying the sample gas.

**Control of the sample gas valves**

The solenoid valves for the sample gas connection are activated by the calibration function via the digital I/O module of the gas analyzer.

To do this, the standard function block application 'Calibration control' must be selected.

The solenoid valves used must be approved for the corresponding explosion protection zone. Suited solenoid valves can be obtained from ABB, see **Optional accessories** on page 18.

**Note**

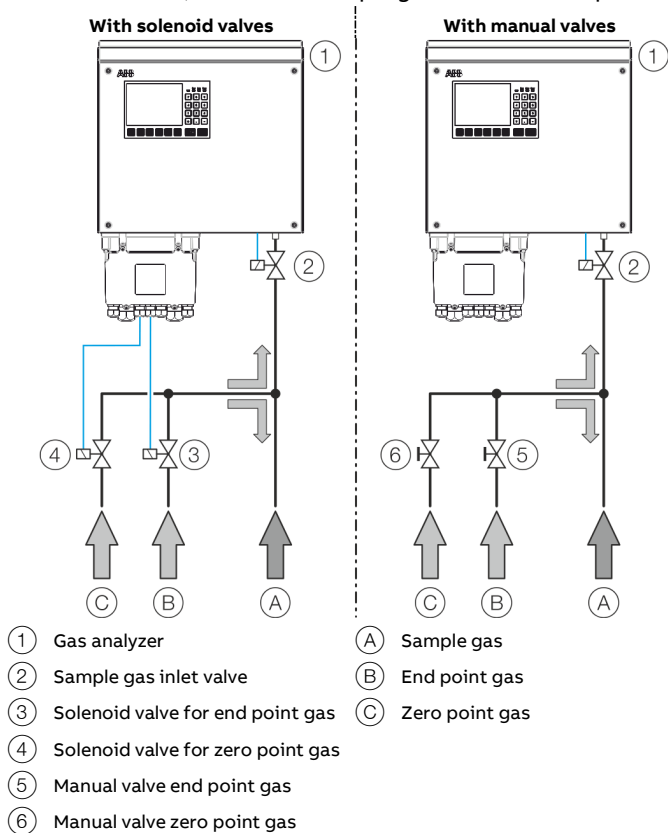
The power supply for the solenoid valves used must be provided by the operator outside the analyzer.

For applications in category 2G/2D, all live supply lines that are routed into the connection box of the Fidas24 Ex must be routed over all poles via the interface relay.

The lines shown in blue in the **Figure 9** and **Figure 10** represent the control signals only.

**Example 1 - The sample gas may be fed into the process**

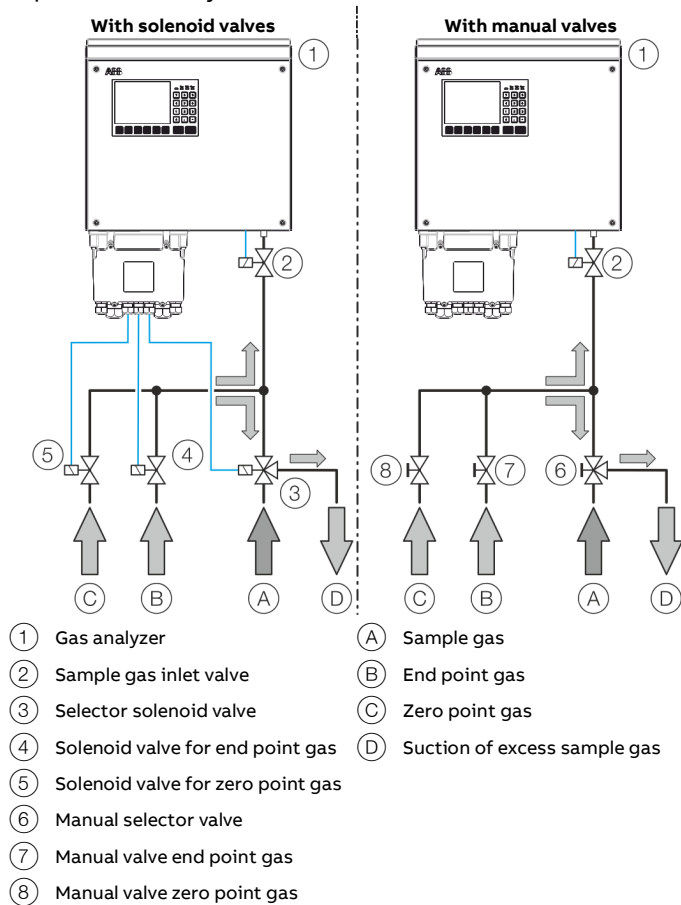
With this variant, the excess sample gas is fed into the process.



**Figure 9: Sample gas discharge into the process**

**Example 2 - The sample gas must not be fed into the process**

With this variant, the excess sample gas is diverted via a separate suction system.



**Figure 10: Sample gas discharge via suction**

## ... 7 Installation

### Connecting the gas lines

#### DANGER

##### Risk of explosion and fire

Explosion and fire risk, due to leaks in the internal gas paths of the appliance and leaking combustion gas.

- Do not open the screw connections of the device internal gas paths!
- Check the seals of the internal gas paths and the combustion gas supply line, according to the maintenance plan!

If screw connections of the device internal gas pass have nevertheless been opened (only by trained personnel), a leakage test with a leak detector (thermal conductivity) must be carried out after closing the gas paths.

#### General information

In order to avoid damage and ensure trouble-free operation, observe the following instructions when connecting the gas lines.

#### 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.

#### Handling of combustion gases

The relevant safety regulations for working with combustion gases must be complied with!

#### 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.

#### Gas lines

- When laying and connecting the gas lines, adhere to the installation instructions provided by the manufacturers of the piping!
- If gas lines made of stainless steel are connected to the analyzer modules, the gas lines must be connected to the building-side equipotential bonding.

#### Mounting the fittings on the gas analyzer

#### NOTE

##### Damage to the gas analyzer

Damage to the gas analyzer, due to melting of the factory-mounted plastic plugs in the sample gas inlets.

- Remove the plastic plugs from the sample gas inlets before commissioning.
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, two threads usually remain visible

#### Note

Screw fittings in carefully, and not too tightly!

#### Checking gas path seal integrity

The sealing integrity of the gas paths in the gas analyzer is tested at the factory.

However, since the tightness of the gas paths may have been affected during transport of the gas analyzer, it is recommended to check the tightness at the site of installation, refer to

**Checking gas path leak tightness** on page 60.



### Connecting the instrument air supply

The instrument air is used as propulsion air for the air jet injector of the analyzer module, and as purging gas for the pressurized enclosure, refer to **Pressurized encapsulation Ex-p** on page 24.

Observe the following points when connecting the instrument air supply:

- The quality of the instrument air must meet the requirements according to **Properties of the instrument air** on page 22.
- Connect the instrument air line to the instrument air inlet **37** of the gas analyzer, via a pressure regulator (0 to 6 bar), refer to **Position and design of the gas connections** on page 29.
- When providing the instrument air for the analyzer and the pressurized encapsulation together, ensure the following:
  - Keep the line distance between the pressure reducer and the analyzer as short as possible.
  - Select supply lines with an inner diameter of at least 6 mm.  
Otherwise, the drop in pressure during initial purging may be so great that the pressure monitor installed in the analyzer will detect an undersupply of instrument air and interrupt the initial purging process.
  - The pressure reducer must be designed for a sufficiently large gas flow volume, refer to **Properties of the instrument air** on page 22.
  - The pressure upstream of the pressure reducer must be sufficiently high.

### Connect the purging air supply

Depending on the quality, for AO2040-Fidas24 Ex the supply of instrument gas and purging gas can be provided in two different ways:

- **Separate supply:**  
Instrument gas and purging gas supply from two separate sources.
- **Common supply:**  
Instrument gas and purging gas supply from a common source. The characteristics of the instrument air supply apply here!

Observe the following points when connecting the purging gas supply:

- The quality of the purging gas must meet the requirements according to **Purging gas properties for pressurized enclosure (FS870S)** on page 22.  
In the case of common instrument gas and purging gas supply, the quality must comply with **Properties of the instrument air** on page 22.
- Connect the purging gas lines to the purging gas valve at the connection chamber, via a pressure controller (0 to 6 bar).
  - Keep the line distance between the pressure reducer and the analyzer as short as possible.
  - The pressure reducer must be designed for a sufficiently large gas flow volume, refer to **Initial purge** on page 25.
  - The pressure upstream of the pressure reducer must be sufficiently high.

### Connect the combustion air supply

Observe the following points when connecting the combustion air supply:

- The quality of the combustion air must meet the requirements according to **Combustion air** on page 23.
- Connect the combustion air line to the combustion air inlet **35** of the gas analyzer, via a pressure regulator (0 to 1.6 bar), refer to **Position and design of the gas connections** on page 29.

## ... 7 Installation

### ... Connecting the gas lines

#### Connecting the exhaust air line

Observe the following points when connecting the exhaust air pipe:

- Conduct exhaust gases from the gas analyzer directly into the atmosphere or through a de-pressurized pipe with a large inside diameter which is as short as possible, or into an exhaust pipe.
- Use PTFE or stainless steel as the material for the exhaust air line!

The temperature of the exhaust air can be up to 200 °C!

- Install the exhaust air line at a gradient, leading away from the gas analyzer.
- At a maximum of 30 cm after the exhaust air outlet, the exhaust air pipe must have an inside diameter of  $\geq 10$  mm!

If the exhaust air pipe is very long, its inside diameter must be much larger than 10 mm, otherwise you might have problems with pressure control in the gas analyzer.

- Do not install any throttle sections or shut-off valves in the exhaust air line!

#### Note

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

#### Connecting the purging air vent

The FS870S purging and monitoring unit is equipped with a particle barrier, in accordance with the EN 60079-2 standard. The air flow at the purging gas outlet of the purging and monitoring unit can thus be led directly into the potentially explosive atmosphere.

If any splashing with water occurs, it is recommended that a pipe with a 90° downward angle be installed at the purging gas outlet.

Observe the following points for the Category II 3D / Dc and II 2D / Db versions:

- The air stream emitted at the purging gas outlet of the purging and monitoring unit must not stir up any dust in the dust-ignition proof area.
- The operator must take appropriate measures to prevent zone elevation due to dust being stirred up.

#### Connect the combustion gas supply

Clean combustion gas line.

1. Pump a cleaning agent (alkaline cleaner, stainless steel pickling solution) through the stainless steel pipe.
2. Rinse the pipe thoroughly with distilled water.
3. Purge the pipe with synthetic air or nitrogen, at a  $> 100$  °C, for several hours (10 to 20 l/h).
4. Seal the ends of the pipe.

#### Connect combustion gas pipe

See also **Connection diagram for the operational gases** on page 30.

1. Connect a two-stage cylinder pressure reducer (a model suitable for high purity gases) to the combustion gas cylinder.
2. Connect the combustion gas pipe to the cylinder pressure reducer.
3. Install a shut-off valve in the combustion gas supply line.
  - It is recommended that a pneumatic shut-off valve be installed.
  - The pneumatic shut-off valve must be controlled by the instrument air supply, so that the combustion gas supply is interrupted in the event of a failure of the instrument air supply.
  - See also **Shut-off valve in the combustion gas supply line** on page 23.
4. Connect the combustion gas line to the combustion gas inlet **36** of the analyzer module, via a pressure regulator (0 to 1.6 bar) refer to **Position and design of the gas connections** on page 29.

#### Check the tightness of the combustion gas line

5. Check the combustion gas line for tightness, refer to **Check the integrity of combustion gas path** on page 60.

## Connecting the sample gas line

### NOTE

#### Damage to the gas analyzer

Damage to the gas analyzer, due to melting of the factory-mounted plastic plugs in the sample gas inlets.

- Remove the plastic plugs from the sample gas inlets before commissioning.

#### Sample gas line connection

A heated or unheated sample gas line can be connected to the sample gas connection of the Fidas24 Ex.

Please note the following points when connecting the sample gas line:

- If the sample gas is pressurized, a T-piece must be connected between the sample gas line and sample gas inlet.  
The free connection of the T-piece must be connected to an exhaust gas discharge line, so that no positive pressure builds up in the analyzer module.
- When connecting a heated sample gas line, the temperature at the sample gas connection may not exceed 130 °C!

## Maximum length of the sample gas line

| Sample gas line          | Maximum length                            |
|--------------------------|---|
| Heated sample gas line   | Maximum 60 m, with a 4 mm inside diameter |
| Unheated sample gas line | Maximum 50 m, with a 4 mm inside diameter |

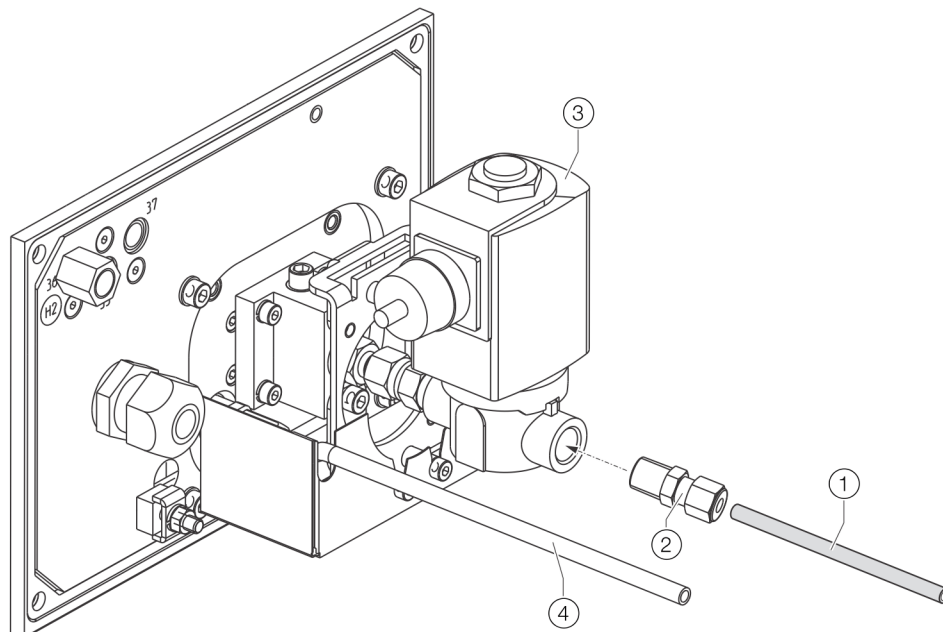
#### Provide for Sample Gas Line Purging

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, e.g. nitrogen, from the gas sampling point, for purging of the sample gas line.

## ... 7 Installation

### ... Connecting the gas lines

Connection of the sample gas line to the unheated sample gas connection



① Sample gas line (heated or unheated, PTFE or stainless steel tubing with a 4/6 mm inside/outer diameter)

② Screw-in connector G $\frac{1}{4}$ "

③ Sample gas valve

④ Exhaust gas tube

Figure 11: Connecting the sample gas line

## 8 Electrical connections

### 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.
- Turn off the power supply before opening the device, and observe a waiting period of 20 minutes, in order to allow any hot components to cool down.

#### **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.

The electrical connection may only be established by authorized specialist personnel and in accordance with the connection diagrams.

The electrical connection information in this manual must be observed; otherwise, the IP rating may be adversely affected. Ground the measurement system according to requirements.

## ... 8 Electrical connections

### Cable glands

#### Connection box on the system housing

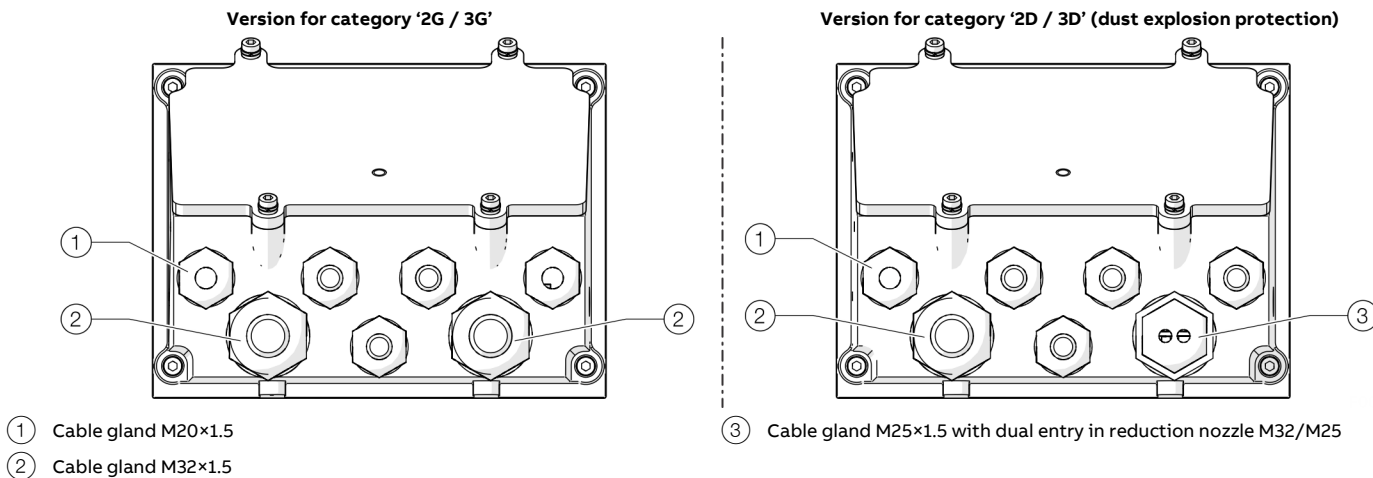


Image 12: Cable glands (view from below)

The electronics module connections are protected with a connection box.

Depending on the version of the instrument, the connection box is equipped with different cable entries:

- In the version for category '2G / 3G': five M20 and two M32 cable glands.
- In the version for category '2D / 3D': five M20, one M32 cable gland and a M25 cable gland with dual entry.

During installation, the clamping range for lines as well as the tightening torques of the cable glands must be observed. The cable glands have several gasket rings which need to be removed as needed depending on the cable diameter.

| Cable gland      | Clamping range for lines and tightening torque |                 |                   |                   |                     |                   |
|------------------|--|-----------------|-------------------|-------------------|---------------------|-------------------|
|                  | Sealing ring 1+2+3                             |                 | Sealing ring 1+2  |                   | Sealing ring 1      |                   |
| M20×1.5          | Ø 5.5 mm / 1.5 Nm                              | Ø 7.0 mm / 1 Nm | Ø 7.0 mm / 1.5 Nm | Ø 9.0 mm / 1.4 Nm | Ø 9.5 mm / 1.0 Nm   | Ø 13 mm / 1.7 Nm  |
| M32×1.5          | —  | —               | Ø 14 mm / 3.0 Nm  | Ø 17 mm / 4.0 Nm  | Ø 17.5 mm / 1.5 Nm  | Ø 21 mm / 1.3 Nm  |
| M25×1.5          | —  | —               | —                 | —                 | Ø 2×4.5 mm / 2.0 Nm | Ø 2×7 mm / 2.0 Nm |
| 2-way            |  |                 |                   |                   |                     |                   |
| Reduction nozzle | Tightening torque: 5 Nm                        |                 |                   |                   |                     |                   |
| M32/M25          |  |                 |                   |                   |                     |                   |

#### Note

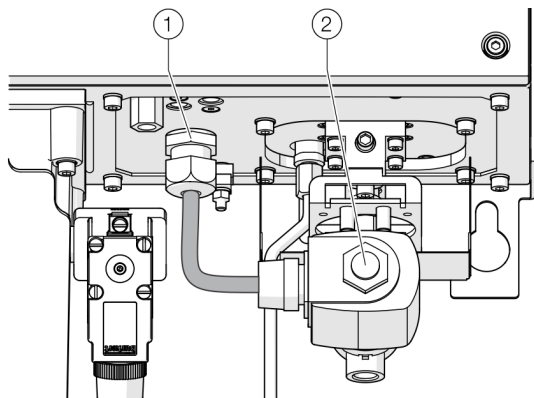
Only suited and cable glands and reduction nozzles approved for the Ex Zone may be used as spare parts.

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

#### Specifications for the selection of cable glands

|   |   |
|---|---|
| Thread sizes in the connection box              | M20×1.5; M32×1.5; M25×1.5 via reduction nozzles M32×1.5/M25×1.5                 |
| Sealing   | Sealing through molded-on gasket ring on the contact surface of the cable gland |
| Maximum surface roughness of the connection box | max. Ra = 8 µm  |
| Wall thickness range of the connection box      | 4 to 5 mm   |

### Sample gas inlet valve



- ① Cable gland M20×1.5  
② Sample gas inlet valve

Figure 13: Cable gland sample gas inlet valve

During installation, the clamping range for lines as well as the tightening torques of the cable glands must be observed. The cable gland has several gasket rings which need to be removed as needed depending on the cable diameter.

#### Clamping range for lines and tightening torque

| Sealing ring       | Ø 5.5 mm / 1.5 Nm | Ø 7.0 mm / 1 Nm   |
|--------------------|-------------------|-------------------|
| Sealing ring 1+2+3 | Ø 5.5 mm / 1.5 Nm | Ø 7.0 mm / 1 Nm   |
| Sealing ring 1+2   | Ø 7.0 mm / 1.5 Nm | Ø 9.0 mm / 1.4 Nm |
| Sealing ring 1     | Ø 9.5 mm / 1.0 Nm | Ø 13 mm / 1.7 Nm  |

#### Note

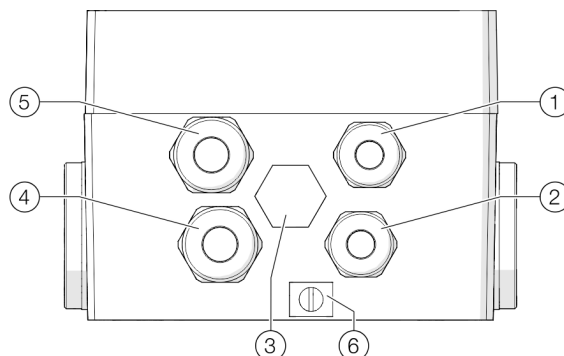
Only suited and cable glands and reduction nozzles approved for the Ex Zone may be used as spare parts.

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

#### Specifications for the selection of cable glands

|                           |   |
|---------------------------|---|
| Thread sizes              | M20×1.5   |
| Sealing                   | Sealing through molded-on gasket ring on the contact surface of the cable gland |
| Maximum surface roughness | max. Ra = 8 µm  |
| Wall thickness range      | 4 to 5 mm   |

### Purging and monitoring unit



- ① Cable gland M16, blue (intrinsically safe circuits)  
② Cable gland M16, gray (purging gas valve)  
③ Ex e blind plug  
④ Cable gland M16, gray (power supply input)  
⑤ Cable gland M16, gray (power supply to gas analyzer)  
⑥ Potential equalization PA

Image 14: Cable glands (view from below)

| Pos. | Clamping range | Tightening torque |
|------|----------------|-------------------|
| ①    | 4 to 8 mm      | 2 Nm              |
| ②    | 4 to 8 mm      | 2 Nm              |
| ③    | —              | 4 Nm              |
| ④, ⑤ | 5 to 10 mm     | 3 Nm              |

#### Note

Only the cable glands and blind plugs listed below may be used as spare parts.

- The use of other cable glands and blind plugs lead to a loss of Ex-approval!
- The manufacturer information regarding installation and storage should be observed!

| Pos. | Manufacturer, type      | Manufacturer order number |
|------|-------------------------|---------------------------|
| ①    | Hummel, HSK-K-Ex-Active | 1.292.1602.50             |
| ②    | Hummel, HSK-K-Ex-Active | 1.292.1601.50             |
| ③    | Hummel, V-Ex Metr.      | 1.297.1601.50             |
| ④, ⑤ | Hummel, HSK-K-Ex-Active | 1.292.1611.50             |

## ... 8 Electrical connections

### Terminal assignment

#### Electronics module

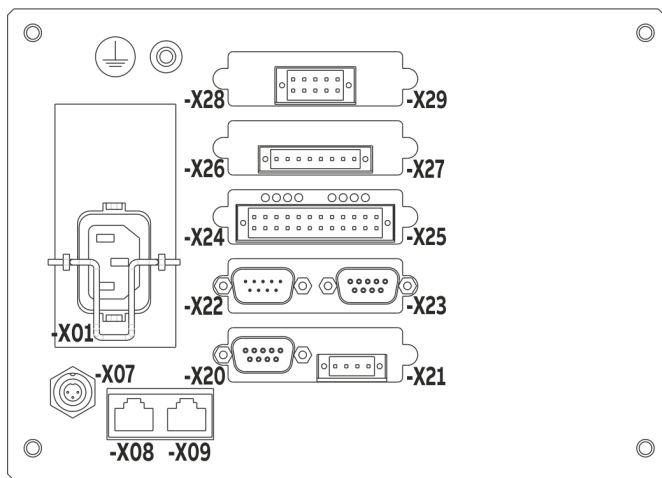



Image 15: Terminal assignment of electronic module (example)

| Connection   | Description  |
|--|--|
| -X01   | Power supply<br>(refer to <b>Connecting the power supply</b> on page 51)   |
| -X07   | System bus<br>(Not used with AO2040Fidas24 Ex)   |
| -X08, -X09   | Ethernet 10/100/1000BASE-T interfaces  |
| -X20 to -X29   | I/O modules (5 slots), options: <ul style="list-style-type: none"> <li>• Profibus-module<br/>(refer to <b>PROFIBUS®-Module</b> on page 40)</li> <li>• Modbus-module<br/>(refer to <b>Modbus®-Module</b> on page 41)</li> <li>• Analog output module (2 or 4-channel)<br/>(refer to <b>Analog output modules</b> on page 42)</li> <li>• Analog output module<br/>(refer to <b>Analog input modules</b> on page 43)</li> <li>• Digital-I/O-module<br/>(refer to <b>Digital I/O module</b> on page 43)</li> </ul> |
|  | Connection for potential equalization<br>(refer to <b>Potential equalization</b> on page 51)   |

The connection diagram shows an example for the equipment of the electronics module with I/O modules.

#### PROFIBUS®-Module

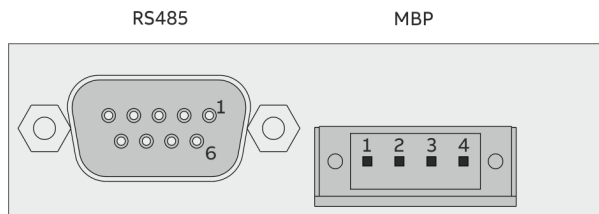


Image 16: PROFIBUS® module

#### RS485 interface

Version: 9-pin sub-D female connector

| Pin | Signal    | Description   |
|-----|-----------|---|
| 1   | —         | not assigned  |
| 2   | M24       | 24 V output voltage, ground                                 |
| 3   | RxD/TxD-P | Receive/transmit data plus, B-line                          |
| 4   | —         | not assigned  |
| 5   | DGND      | Data transmission potential<br>(Reference potential for VP) |
| 6   | VP        | Supply voltage plus (5 V)                                   |
| 7   | P24       | 24 V output voltage plus, max. 0.2 A                        |
| 8   | RxD/TxD-N | Receive/transmit data N, A-line                             |
| 9   | —         | not assigned  |

#### MBP Interface (not intrinsically safe)

Model: 4-pole plug-in terminal strip with mating connector  
(included in the scope of delivery).

| Pin | Signal   |
|-----|----------|
| 1   | +        |
| 2   | Shield   |
| 3   | -        |
| 4   | not used |

#### Note

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



**Note**

The PROFIBUS® protocol is an unsecured protocol (in the context of IT or cyber security), therefore the intended application should be assessed before implementation, in order to ensure that the protocol is suitable.

**PROFIBUS® plug**

Due to the limited space available in the connection chamber, the PROFIBUS PA plug listed below must be used.

| Manufacturer, type   | Manufacturer order number |
|----------------------|---------------------------|
| ERNI, ERbic PROFIBUS | 366311                    |

**Note**

The device must be de-energized before connecting the PROFIBUS plug (Sub-D).

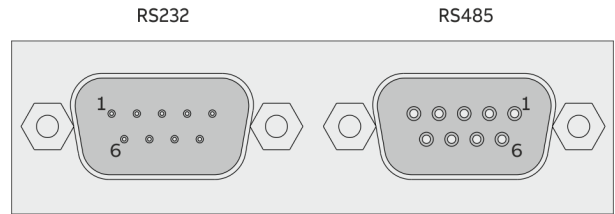
**Modbus®-Module**

Figure 17: Modbus module

**RS232 Interface**

Version: 9-pin sub-D male connector

| Pin | Signal |
|-----|--------|
| 2   | RxD    |
| 3   | TxD    |
| 5   | GND    |

**RS485 interface**

Version: 9-pin sub-D female connector

| Pin | Signal |
|-----|--------|
| 2   | RTxD-  |
| 3   | RTxD+  |
| 5   | GND    |

**Note**

The Modbus® protocol is an unsecured protocol, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

## ... 8 Electrical connections

### ... Terminal assignment

#### Analog output modules

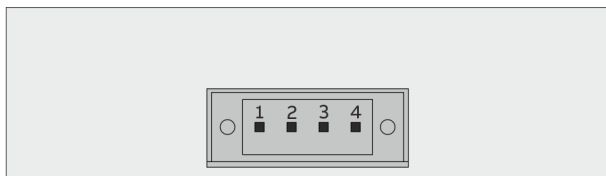


Image 18: 2-way analog output module

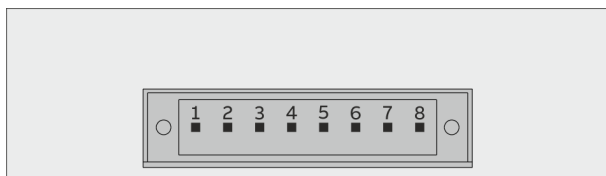


Image 19: 4-way analog output module

| Pin | Signal |
|-----|--------|
| 1   | AO1+   |
| 2   | AO1-   |
| 3   | AO2+   |
| 4   | AO2-   |
| 5   | AO3+   |
| 6   | AO3-   |
| 7   | AO4+   |
| 8   | AO4-   |

#### Analog outputs AO1 to AO4

0/4 to 20 mA (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 Ohm. Resolution 16 bit.

The output signal cannot be lower than 0 mA.

#### Version

4-pole or 8-pole plug-in terminal strip with counter plug (included in the scope of delivery).

#### Terminal assignment

An analog output is allocated in the sequence of the sample components for each sample component.

The sequence of the sample components is documented in the analyzer data sheet and on the name plate.

#### Note

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

**Analog input modules**

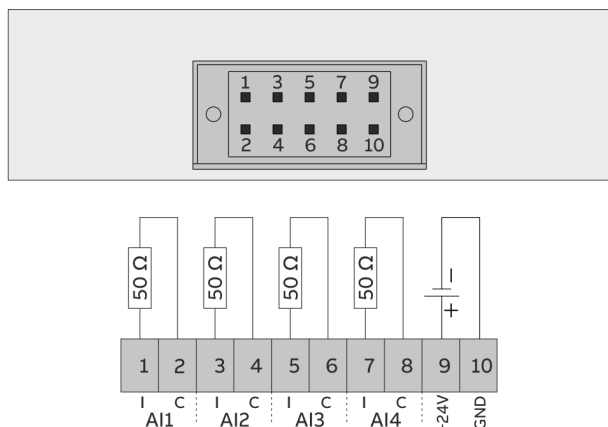


Figure 20: Analog input module

| Pin | Signal | Description   |
|-----|--------|---|
| 1   | AI1+   | -20 to +20 mA, load 50 Ω,                             |
| 2   | AI1-   | up to 10 V isolated from each other                   |
| 3   | AI2+   |   |
| 4   | AI2-   |   |
| 5   | AI3+   |   |
| 6   | AI3-   |   |
| 7   | AI4+   |   |
| 8   | AI4-   |   |
| 9   | +24 V  | +24 V DC for supply of an external sensor, fused with |
| 10  | GND    | 100 mA (self-resetting fuse)                          |

**Design**

2x5-pin terminal strip with mating connector (included in the scope of delivery).

**Digital I/O module**

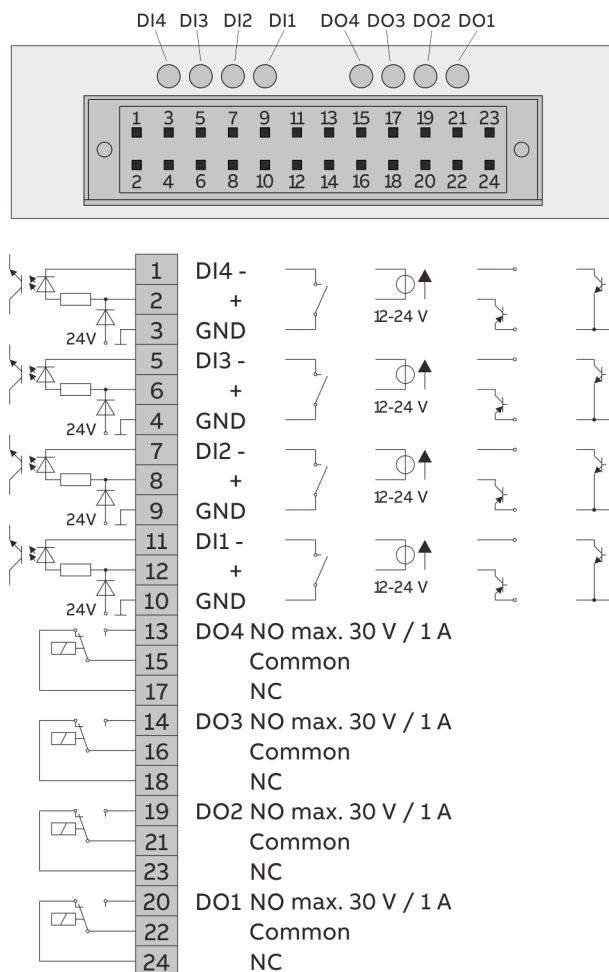


Image 21: Electrical connections, digital I/O module

## ... 8 Electrical connections

### ... Terminal assignment

#### Digital inputs DI1 to DI4

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 DO1 to DO4

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 suitable protective measures (self-induction recuperation diodes for inductive loads and series resistors for capacitive loads).

Relays are shown in the unpowered state.

The unpowered state corresponds to the state in the event of a fault ("fail safe").

#### Version

2 × 12-pole plug-in terminal strip with mating connector (included in the scope of delivery).

## Standard assignment of the digital inputs/outputs (I/O)

### Status signals, externally controlled calibration:

| Individual status signal: |                          | Sum status signals:      |
|---------------------------|--------------------------|--------------------------|
| DO1                       | Failure                  | Overall status           |
| DO2                       | Function Check           | Limitation               |
| DO3                       | Maintenance Required     | Limitation               |
| DO4                       | External solenoid valve  | External solenoid valve  |
| DI1                       | Start auto-calibration   | Start auto-calibration   |
| DI2                       | Disable auto-calibration | Disable auto-calibration |
| DI3                       | Calibrate zero-point     | Calibrate zero-point     |
| DI4                       | Calibrate end-point      | Calibrate end-point      |

### Measurement range control

|     |                             |  |
|-----|-----------------------------|--|
| DO1 | Measuring range feedback    |  |
| DO2 |                             |  |
| DO3 |                             |  |
| DO4 |                             |  |
| DI1 | Measuring range switch-over |  |
| DI2 |                             |  |
| DI3 |                             |  |
| DI4 |                             |  |

### Limit values

|     |                          |
|-----|--------------------------|
| DO1 | Limitation               |
| DO2 | Limitation               |
| DO3 | Limitation               |
| DO4 | Limitation               |
| DI1 | Calibration cells on/off |
| DI2 | Hold current output      |
| DI3 | Pump on/off              |
| DI4 | External failure         |

### Calibration control

|     |                                    |
|-----|------------------------------------|
| DO1 | External solenoid valve sample gas |
| DO2 | External solenoid valve zero gas   |
| DO3 | External solenoid valve span gas   |
| DO4 | External pump on/off               |
| DI1 | Pump on/off                        |
| DI2 | External failure                   |
| DI3 | External failure                   |
| DI4 | External solenoid valve sample gas |

## ... 8 Electrical connections

### ... Terminal assignment

#### Standard terminal connections

##### Principles

The terminal connections are assigned as follows:

- in the order of the registered analyzer modules and
- in the order of the measuring components, within an analyzer module.

The sequence of the analyzer modules and sample components is documented in the analyzer data sheet and on the name plate.

Beginning with Analyzer Module 1 and Measuring Component 1, the input and output functions are distributed sequentially to the available free connections of the I/O modules (sockets **-X20 to -X29**).

#### Profibus, Modbus

The socket for the optional Profibus module is always **-X20**, refer to **PROFIBUS®-Module** on page 40.

The socket for the optional Modbus module is **-X20**, or if there is also a Profibus module, **-X22**, refer to **Modbus®-Module** on page 41.

#### Analog outputs

Analog outputs are available on the 2-channel analog output module or the 4-channel analog output module, refer to **Analog output modules** on page 42.

An analog output is allocated in the sequence of the sample components for each sample component.

#### Limit value outputs

Limit value outputs are available on the digital I/O-module, with the following standard function block applications:

- Application "Status signals/ext. Calibration", if the gas analyzer is set to total status when an analyzer module is installed.

or

- Application "Limit values"

See **Digital I/O module** on page 43 and **Standard assignment of the digital inputs/outputs (I/O)** on page 45.

A limit is allocated in the sequence of the sample components for each sample component.

### Standard Application Measuring Range Control

Measuring range control can be implemented for all sample components with more than one measuring range.

Each digital-I/O module contains:

- 4 digital inputs (DI) for switching the measuring range and
- 4 digital outputs (DO) for measuring range feedback.

| Sample component with | Assignment    | DI and DO configuration |                    |
|-----------------------|---------------|-------------------------|--------------------|
| 2 measurement ranges  | 1 DI and 1 DO | NO open:                | Measuring range 1, |
|                       |               | NO closed:              | Measuring range 2  |
| 3 measurement ranges  | 3 DI and 3 DO | NO closed:              | active meas. range |
| 4 measurement ranges  | 4 DI and 4 DO | NO closed:              | active meas. range |

The measuring range control is not installed across I/O modules.

#### Example:

A gas analyzer contains 4 sample components with the following number of measuring ranges:

| Sample components        | Measurement range quantity         |
|--------------------------|------------------------------------|
| Sample component 1 (SC1) | 3 measuring ranges (MR1, MR2, MR3) |
| Sample component 2 (SC2) | 3 measuring ranges (MR1, MR2, MR3) |
| Sample component 3 (SC3) | 2 measuring ranges (MR1, MR2)      |
| Sample component 4 (SC4) | 2 measuring ranges (MR1, MR2)      |

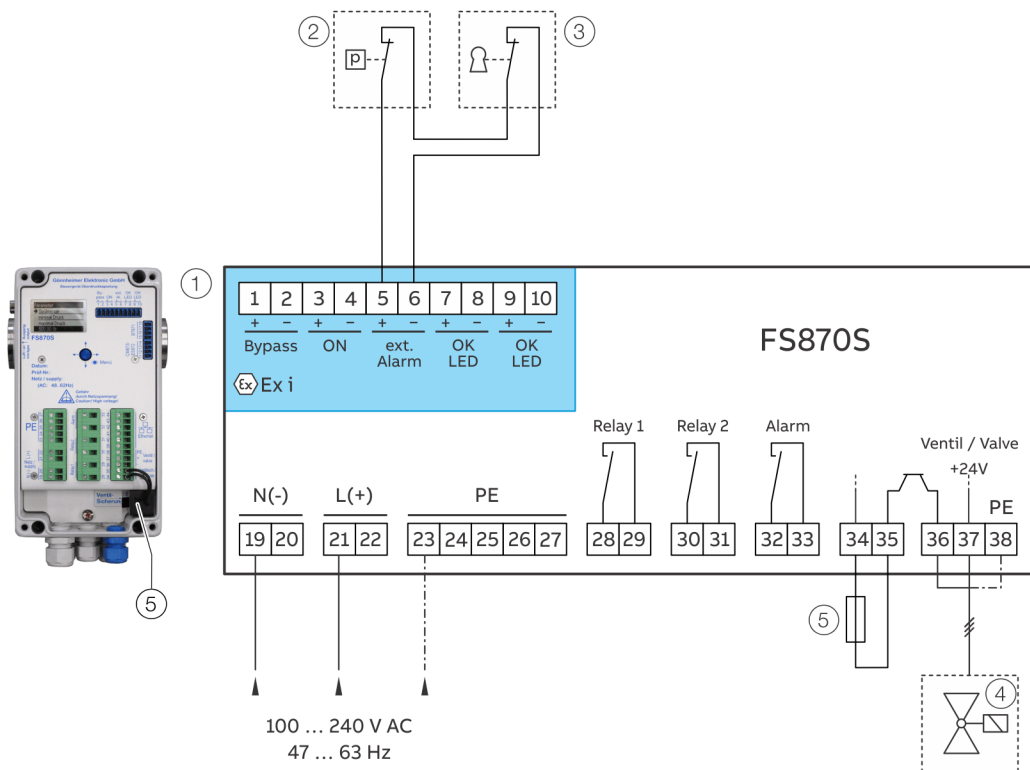
The following connection assignments result from this:

| Allocation for 1. I/O module |               | Allocation for 2. I/O module |               |
|------------------------------|---------------|------------------------------|---------------|
| DI/DO 1:                     | MK1: MB1      | DI/DO 1:                     | MK2: MB1      |
| DI/DO 2:                     | MK1: MB2      | DI/DO 2:                     | MK2: MB2      |
| DI/DO 3:                     | MK1: MB3      | DI/DO 3:                     | MK2: MB3      |
| DI/DO 4:                     | MK3: MB1, MB2 | DI/DO 4:                     | MK4: MB1, MB2 |

## ... 8 Electrical connections

### ... Terminal assignment

#### Purging and monitoring unit FS870S



- ① Purging and monitoring unit FS870S
- ② Pressure switch for monitoring of the instrument air
- ③ Key switch for category 3D / 2D (Dc / Db)
- ④ Magnetic valve for the purging gas
- ⑤ Fuse for purging gas solenoid valve

Image 22: Purging and monitoring unit FS870S

#### Note

The components ②, ③, ④ as well as the power supply to the gas analyzer are pre-wired at the factory.

#### Connections for power supply on the FS870S purging and monitoring unit

| Terminal | Function/comments     |
|----------|-----------------------|
| 19 / N   | Neutral conductor     |
| 21 / L   | Phase                 |
| 23 / PE  | Protective earth (PE) |

#### Relay output connections

| Terminal | Function/comments  |
|----------|--|
| 28 / 29  | <b>Relay output 1 / 2</b>  |
| 30 / 31  | De-energize the gas analyzer, pre-wired at the factory                             |
| 32       | <b>Alarm output</b>  |
| 33       | Potential-free relay output for external signal transmitter, maximum 235 V AC, 5 A |

#### Connections for intrinsically safe inputs/outputs

| Terminal | Function/comments   |
|----------|---|
| 1 / 2    | <b>Not assigned</b>   |
| 3 / 4    | <b>Not assigned</b>   |
| 5 / 6    | <b>Input "Ext. Alarm"</b><br>Connected to the pressure switch internally, for monitoring of the instrument air supply. With devices for category 3D / 2D (Dc / Db), the additional key switch is also connected here. |
| 7+ / 8-  | <b>Not assigned</b>   |
| 9+ / 10- | <b>Not assigned</b>   |



## Connecting the Signal Lines

### Safety instructions

- Follow local regulations on installing and connecting electrical wiring.
- Lay the signal lines separately from the power supply lines.
- Lay analog and digital signal lines separately from each other.
- Label cables or counter plug so that they can be clearly allocated to the corresponding I/O modules.

### Materials required (not included in the scope of delivery)

Refer to **Signal Lines** on page 20.

### Connecting the Signal Lines

1. Only for the system housing with a connection box:  
Feed the cables through the cable glands and strip them over a length of approx. 20 cm.
  - M20 cable glands:  
Remove the plug from the insert; leave the ring in the gland to act as a seal and to provide strain relief.
  - M32 cable glands:  
Remove the plug from the gland. Remove the drilled insert from the accessory bag and press it over the cable; close any free drill holes with dowel pins from the accessory bag.
2. Connect the cables to the opposite connectors, according to the connection diagrams of the I/O modules.
3. Connect the opposite connectors to the plug-in terminal strips on the I/O modules.

## Connecting the key switch

For the Category 3D/2D (Dc/Db) versions, an additional key switch must be installed by the operator. The key switch is used to confirm the internal cleaning of the housing before commissioning (removal of dust deposits), and to enable purging of the housing.

The key switch must be installed close to the gas analyzer and clearly labeled as belonging to the gas analyzer.

The key switch is connected to the intrinsically safe line after preinstalled at the factory. The line is switched internally in series with the instrument air monitoring pressure switch and is connected to the 'Ext. Alarm' input of the purging and monitoring unit FS870S.

The key switch can be optionally ordered from ABB, for ordering information, see **Connecting the key switch** on page 49.

Alternatively, a suited key switch must be provided onsite by the operator.

### Note

The optional key switch must be approved for use in the corresponding explosion protection zone.

### Electrical data (Ex-data)

The following maximum connection parameters must not be exceeded when connecting the key switch.

---

#### Input 'Ext. Alarm'

---

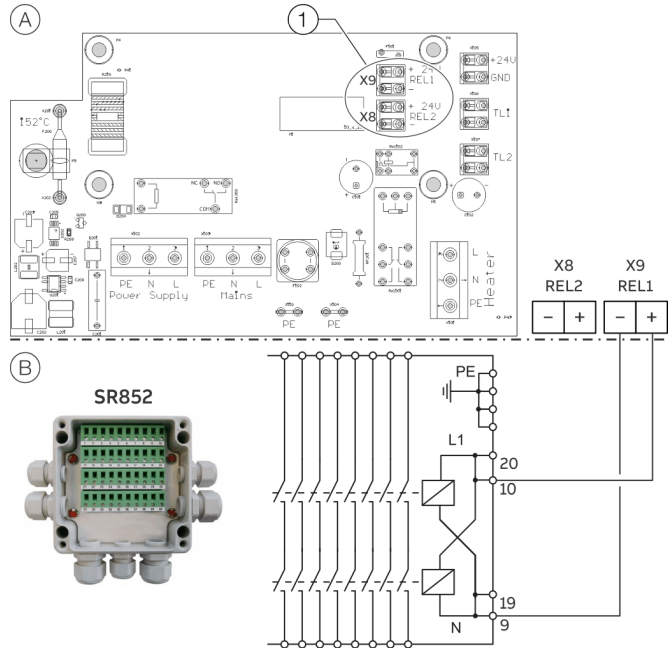
|                              |                  |
|------------------------------|------------------|
| Maximum external inductivity | $L_O$ : 0.497 mH |
|------------------------------|------------------|

|                           |                  |
|---------------------------|------------------|
| Maximum external capacity | $C_O$ : 99.52 nF |
|---------------------------|------------------|

---

## ... 8 Electrical connections

### Connecting the interface relay



- (A) Outputs for the interface relay
- (B) Example connection for the interface relay SR852
- ① The terminals in the terminal compartment of the gas analyzer

Figure 23: External Interface relay (connection diagram, example)

The optional interface relay is used for isolating all of the poles on the operator's side (e.g. bus systems) which could remain live when the analyzer is disconnected from the power supply (e.g. due to a separate power supply).

| System bus, computer interfaces |                         |
|---------------------------------|-------------------------|
| Terminals                       | X9 (REL1), X8 (REL2)    |
| Output Voltage                  | 24 V DC                 |
| Maximum output current          | 0.27 A                  |
| Maximum output power            | 6.5 W                   |
| Short circuit protection        | Self-resetting PTC fuse |

\* The data specified applies to both outputs together!

#### Electrical connection


Two 24 V DC outputs (X8, X9), for the control of the external interface relays, are located on the mains connection board, in the connection box of the gas analyzer.

- Designed for the interface relays with 16 contacts (24 V DC, 80 mA, 2 W) available from ABB as an accessory.
- The 24V control connections of the ABB interface relays can be set up as cascade relays (Terminals 19, 20).

#### Note

The specified electrical data for the outputs may not be exceeded. This applies especially when connecting third-party relays and cascading relays.

## Potential equalization

The electronic module and the analyzer modules each have a connection marked with the symbol , for connection to the equipotential bonding at the building.

The connection has a M5 female thread for screwing in suitable screws or terminals.

If required by the relevant installation regulations, the electronic module and each analyzer module must be connected to the building's equipotential bonding via this connection.

## Connecting the power supply

### Protective lead connection

The protective lead (ground) should be attached to the protective lead connector before any other connection is made.

### Risks of a disconnected protective lead

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

### Electrical data for the power supply

The power supply unit built into the system housing is used to supply the 24 V DC to the Fidas24 Ex module and the associated electronics with DC energy.

---

#### Power supply (entire device)

---

|                                   |   |
|-----------------------------------|---|
| Input voltage                     | 110 to 230 V AC, $\pm 10\%$   |
| Input Current                     | Maximum 2.5 A   |
| Line Frequency Range              | 50 to 60 Hz, $\pm 3\%$  |
| Power consumption (entire device) | Maximum 200 VA  |
| Output Voltage                    | 24 V DC, $\pm 3\%$<br>(for optional cut-off relay control)  |
| Connection                        | At the corresponding terminals of the purging and monitoring unit, refer to <b>Purging and monitoring unit FS870S</b> on page 48. |

---

## Battery

### Application

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

### Type

Lithium button cell 3 V CR 2032

### Note

Only the original battery type may be used as a replacement:

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

## ... 8 Electrical connections

### ... Connecting the power supply

#### Connecting power supply lines

1. Ensure that the power supply feeder has an adequately dimensioned protective device (circuit-breaker).
2. Install an easily accessible supply circuit isolator or a switched socket in the power supply line, close to the device, so that all the poles of the device 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.
3. Connect the power supply to the corresponding terminals of the purging and monitoring unit FS870S.
  - The power supply line for the gas analyzer is already connected to the purging and monitoring unit at the factory.
4. If stipulated by the relevant installation regulations, connect the device to the building's potential equalization grounding system.

#### Note

The device can be put into operation as soon as it is connected to the power supply of the building.

#### Connections for power supply on the FS870S purging and monitoring unit

| Terminal | Function/comments     |
|----------|-----------------------|
| 19 / N   | Neutral conductor     |
| 21 / L   | Phase                 |
| 23 / PE  | Protective earth (PE) |

## 9 Commissioning

### 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.
- Turn off the power supply before opening the device, and observe a waiting period of 20 minutes, in order to allow any hot components to cool down.

#### **NOTE**

##### Damage to the gas analyzer

Damage to the gas analyzer, caused by the presence of condensate, dust or combustion gases in the sample gas lines during commissioning.

- Purge the sample gas path before commissioning (refer to **Purging the sample gas path** on page 55).
- Observe the condition of the sample gas inlet of the analyzer modules.

#### 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

Before commissioning, check the installation of the gas analyzer, according to the following checklist.

| Inspection  | Additional Information   | ✓                        |
|---|--|--------------------------|
| Is the gas analyzer firmly mounted?   | Refer to <b>Mounting</b> on page 28.   | <input type="checkbox"/> |
| Are all the gas lines connected correctly?  | Refer to <b>Connecting the gas lines</b> on page 32.                         | <input type="checkbox"/> |
| Are all devices needed for gas conditioning, calibration and waste gas disposal correctly connected and ready for use?  | —  | <input type="checkbox"/> |
| Is the pneumatic shut-off valve (if present) correctly installed within the combustion gas line and has its functionality been checked?   | Refer to <b>Shut-off valve in the combustion gas supply line</b> on page 23. | <input type="checkbox"/> |
| Have all the gas lines/gas connections (internal/external) been checked for seal integrity?   | Refer to <b>Checking gas path leak tightness</b> on page 60.                 | <input type="checkbox"/> |
| Have all the signal, control and interface lines, the power supply lines and, if applicable, the system bus been correctly laid and connected?                                    | Refer to <b>Electrical connections</b> on page 37.                           | <input type="checkbox"/> |
| Does the instrument air supply meet the quality requirements?   | Refer to <b>Properties of the instrument air</b> on page 22.                 | <input type="checkbox"/> |
| Is the housing of the purging and monitoring unit FS870S closed properly, and have all cable glands been tightened and have the unused cable glands been sealed with dummy plugs? | —  | <input type="checkbox"/> |
| Is the system housing closed properly, and have all cable glands been tightened and have the unused cable glands been sealed with dummy plugs?                                    | —  | <input type="checkbox"/> |

**For Category 2G/2D versions, the following also apply:**

| Inspection  | Additional Information                                     | ✓                        |
|---|--|--------------------------|
| Are all externally connected input and output signals, which could remain live in the event of a power shutdown or failure of the pressurized enclosure, routed via an cut-off relay? | Refer to <b>Connecting the interface relay</b> on page 50. | <input type="checkbox"/> |

**For Category 3D/2D (Dc/Db) versions, the following also apply:**

| Inspection   | Additional Information                                      | ✓                        |
|--|---|--------------------------|
| Is the key switch mounted and correctly connected to the intrinsically safe signal line designated for this purpose? | Refer to <b>Connecting the key switch</b> on page 49.       | <input type="checkbox"/> |
| Is the purging air outlet of the purging and monitoring unit arranged in such a way that no dust can be stirred up?  | Refer to <b>Connecting the purging air vent</b> on page 34. | <input type="checkbox"/> |

## ... 9 Commissioning

### Information regarding the type of ignition protection “pressurized encapsulation – Ex p”

#### Initial purging upon commissioning

The initial purging of the housing ensures that there is no explosive gas/air mixture inside the analyzer housing when the power supply is switched on.

The initial purging process is automatically controlled by the purging and monitoring unit FS870S.

- 1 As soon as the power and instrument air supply to the purging and monitoring unit has been set up, the initial purging process begins.
- 2 Once the initial purging process has been successfully completed and the specified internal housing pressure has been generated, the power supply to the analyzer is established and the analyzer commences the start routine.

#### Special features of the design for Categories 3D/2D (Dc/Db)

The dust explosion protection version is also equipped with a key switch, to which the purging and monitoring unit is connected.

The operator must use this key switch to confirm that the interior of the housing has been cleaned of dust deposits before commissioning.

Otherwise, initial purging could stir up dust deposits inside the housing, creating a combustion atmosphere within

#### PIN codes and purging parameters

##### **NOTE**

##### **Loss of explosion protection approval**

Loss of explosion protection approval, due to changes to the purging parameters that have been preset at the factory.

- The ex-works preset rinsing parameters must not be changed under any circumstances.

##### **Note**

The parameterization of the purging and monitoring unit is protected by PIN codes. During commissioning, the PIN codes must be changed and documented by the operator. This ensures that only authorized persons are granted access to the parameterization of the purging and monitoring unit.

#### PIN codes for the purging and monitoring unit FS870S

| PIN code                 | Description  |
|--------------------------|--|
| <b>M-Code:</b> 0001      | The M-Code allows writing access to the menu of the purging and monitoring unit.   |
| <b>By-Code</b> 0002      | The By-Code allows the operator to bypass the pressurized enclosure.<br>The gas analyzer can then be switched on, even when the housing is open. |
| <b>E/A-Code</b> 0001     | The E/A-Code enables one to switch the power supply of the gas analyzer on and off.  |
| <b>Request code</b> 1000 | The request code allows reading access to the menu of the purging and monitoring unit.   |

#### Purging parameters of the purging and monitoring unit FS870S

| <b>Initial purging parameters</b>                |                    |
|--|--------------------|
| Min. initial purging volume                      | 250 l              |
| Min. through-flow for initial purging            | 0.3 l/s = 1080 l/h |
| Nominal flow rate for initial purging            | 1 l/s = 3600 l/h   |
| Pre-adjusted working pressure                    | 4 hPa              |
| <b>Operating parameters (continuous purging)</b> |                    |
| Purge gas  | Air                |
| Min. flow during operation                       | 0.3 l/s = 1080 l/h |
| Nominal flow during operation                    | 0.5 l/s = 1800 l/h |
| Nominal pressure during operation                | 2 hPa              |
| Lower shut-off pressure during operation         | 0.8 hPa            |
| Upper shut-off pressure during operation         | 15 hPa             |
| Signal pressure during operation                 | < 1.5 hPa          |

## Commissioning of pressurized encapsulation

### Note

If work has been carried out on gas-carrying components, the analyzer system must be rechecked for leaks.

Commission the pressurized encapsulation according to the following instructions:

1. Clean both the interior and the exterior of the gas analyzer system housing to remove any dust (only for Cat. 3D/2D, Dc/Db) and close it tightly with the 4 housing screws.
2. Switch on the instrument air supply and check the nominal pressure, in accordance with **Properties of the instrument air** on page 22.
  - With the purging air supply disconnected: Switch on the purging air supply and check the nominal pressure, in accordance with **Purging gas properties for pressurized enclosure (FS870S)** on page 22.
3. Switch on the power supply at the mains isolation device assigned to the gas analyzer.
  - The purging and monitoring unit will now perform a self-test. Thereafter, the inputs are checked for any pending errors.
  - Errors that might occur are an insufficient instrument air supply pressure or (if a key switch is present) no acknowledgement that the housing has been cleaned at the key switch.
4. Now confirm the cleaning of the system housing at the key switch (only for Cat. 3D/2D, Dc/Db). In order to do so, set the key switch to Position "I".
  - In the absence of errors, the purging and monitoring unit commences initial purging.
    - During initial purging, the purging and monitoring unit displays the remaining purging volume.
  - After successful initial purging, the purging and monitoring unit switches to operating mode and adjusts the purging air pressure and flow to the setpoints.
  - If the setpoints are stable, the power supply to the gas analyzer is opened and the gas analyzer begins with the startup procedure.

## Purging the sample gas path

Before the gas analyzer is commissioned the sample gas line must be purged, from the sampling point to the gas analyzer. This guarantees that the sample gas line is free of dust deposits and impurities, e.g. corrosive gases, during commissioning. This is also intended to prevent any potentially explosive gas / air mixture present in the sample gas line from igniting when the power supply is switched on.

For this purpose, the customer must install a T-piece in the sample gas line, close to the sample gas valve of the gas analyzer, since the sample gas valve is closed during initial purging.

### Purge gas

Nitrogen or instrument air should be used as a purge gas. When purging with instrument air, 5 times the volume of the sample gas line must be purged to safely displace any potentially explosive gas / air mixture.

### Purge time

The purging time depends on the purging gas flow rate and the volume to be purged (line length).

## ... 9 Commissioning

### Gas analyzer start-up

#### Note

The power supply for the gas analyzer is switched on automatically once the pressurized encapsulation has been commissioned.

#### Heating-up phase, connect supply gases

- The following events will occur after the power supply is turned on:
  - The three LEDs "Power", "Maint" and "Error" light up.
  - The LCD indicator shows the individual phases of the starting procedure and the software version.
  - After a short time, the display changes to measuring mode, refer to Fehler! Verweisquelle konnte nicht gefunden werden. on page Fehler! Textmarke nicht definiert..
- Select the 'Controller values' menu item: 'MENU / Diagnostic/Information / Module specific / Controller values'  
Under this menu item, both the actual and setpoint values and the manipulated variables of the internal temperature controllers are displayed:
  - T-Re.D:** Detector temperature
  - TR.VV1:** Temperature of the pre-amplifier
 The temperature values increase slowly after activating the power supply.
- Connect the supply of instrument air, combustion air and combustion gas (H<sub>2</sub>) When the instrument air is switched on, the air jet pump starts working immediately. The pressures that are set have not yet been regulated.  
First set the pressure to the values specified in **Operational gases** on page 22 by means of the respective external pressure regulator.
- The 'Controller values' menu item also displays both the actual and set point values and the manipulated variables of the internal pressure controllers:
  - C Air:** Combustion air pressure
  - C Gas:** Combustion gas pressure (H<sub>2</sub>)
  - MGE:** Pressure at the sample gas nozzle
  - MGA:** Pressure in the combustion chamber (output)
 The following status messages are active during the heating-up phase:

- During the heating phase, the following status messages are displayed:

| Message                      | Description  |
|------------------------------|--|
| Working temperature          | the temperature of the detector has not yet reached the threshold.   |
| Flame error                  | the flame has not yet ignited.   |
| Temperature limit value 1, 2 | The temperature of the detector ( <b>T-Re.D</b> ) exceeds or undercuts the upper or lower limit value 1 or 2.  |
| Pressure limit value 1, 2    | The pressure at one of the internal pressure controllers for instrument air ( <b>inlet, outlet</b> ), combustion air ( <b>air</b> ) or combustion gas (H <sub>2</sub> ) is above or below the upper or lower limit value 1 or 2. |

- As soon as the temperature of the detector has reached the threshold value (150 °C), the external sample gas valve opens. The negative pressure regulation and the combustion air regulation attempt to adjust the pressures to the respective set point.  
When the external sample gas valve is opened, the sample gas begins to flow through the analyzer.
- After the pressures have been adjusted to the respective set point, the respective solenoid valve in the analyzer automatically connects the combustion gas. The combustion gas regulation attempts to adjust the pressure to the set point.

#### Adjust output variables of the internal pressure controllers

If the analyzer cannot be commissioned automatically with the pressure values specified in the device data sheet, the manipulated variables of the internal pressure controllers must be adjusted.

#### Note

In order to bring the pressure regulators into a more favorable control range, the external supply pressures can be adapted with the aid of the manipulated variables. However, this should only be done once the flame has been ignited.

In general, this is not necessary.

- Instrument air:
  - Use the external pressure regulator to set the controlled variable for Outlet to approx. 60 % (max. 70 %).
  - Controlled variable too high** -> reduce pressure.
  - Controlled variable too low** -> increase pressure.
  - (The controlled variable for "Inlet" depends on the sample gas flow rate.)



- 9. Combustion air:  
Use the external pressure regulator to set the control variable for “air” to approx. 55 % (max. 60 %).  
**Controlled variable too high** -> increase pressure.  
**Controlled variable too low** -> reduce pressure.
- 10. Combustion air:  
Use the external pressure regulator to set the manipulated variable for ‘H<sub>2</sub>’ to approx. 42 % (max. 52 %).  
**Controlled variable too high** -> increase pressure.  
**Controlled variable too low** -> reduce pressure.

**Igniting the flame**

11. Flame ignition is automatic.

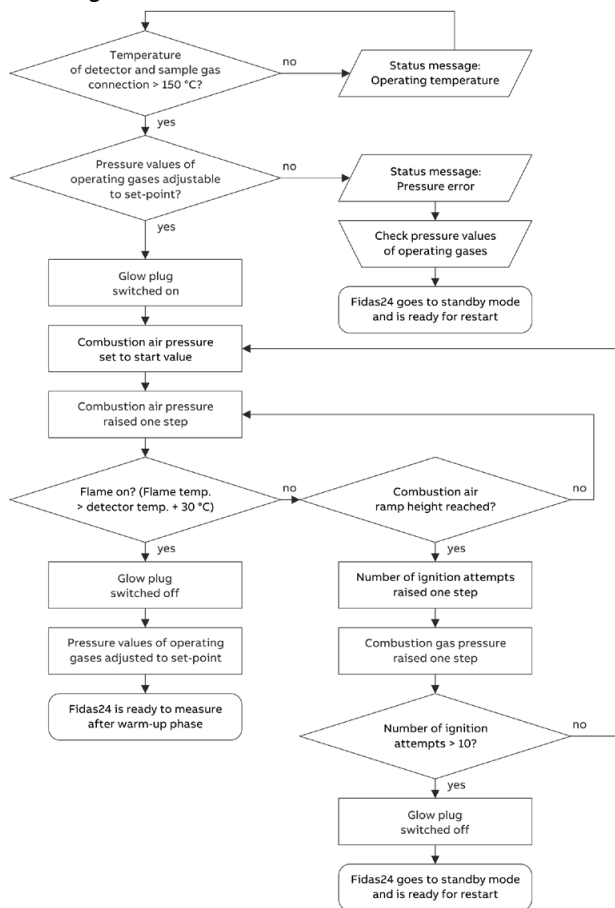


Image 24: Igniting the flame

Depending on the number of ignition attempts, flame ignition can take up to 10 minutes.

On initial commissioning of the gas analyzers, it may occur that, depending on the position of the combustion gas line, there is not sufficient combustion gas available to ignite the flame at first.

In this case, you need to go to the ‘Standby/Restart FID’ menu to restart the ignition of the flame, see **Fidas24 – Standby/Restart** on page 59.

The flame is considered to be ‘on’ when the flame temperature is above a determined threshold value. As long as the flame is not detected as ‘on’, the ‘Flame-Error’ error message is displayed in the status messages window.

The temperature of the flame is displayed under the ‘Auxiliary raw values’ menu item within the ‘Flame’ parameter.

With the ignition of the flame, the actual commissioning of the gas analyzers is ended.

**Note**

Unused sample gas lines and sampling probes may continue to emit hydrocarbons for an extended period after initial operation. As a result, the measured value drift after initial commissioning can exceed the measured value drift specified in the data sheet. Depending on the material, length of the sample gas line and sample probes as well as the selected measuring range, this time period can be up to a week.

## ... 9 Commissioning

### ... Gas analyzer start-up

#### Warming-up phase

The duration of the warm-up phase of the Fidas24 Ex is usually  $\leq 2$  hours (at typical supply voltage and an ambient temperature of 20 °C).

#### Note

- The warm-up phase may be prolonged if the gas analyzer has not yet reached room temperature before the power supply is switched on.
- During the warm-up phase, the measured values may be outside of the values specified in the data sheet.

#### End of the warm-up phase

The warm-up phase is considered to be completed once the measured value drift has reached an acceptable value. This is dependent on the magnitude of the measuring range.

#### Note

Unused sample gas lines and sampling probes may continue to emit hydrocarbons for an extended period after initial operation. As a result, the measured value drift after initial commissioning can exceed the measured value drift specified in the data sheet. Depending on the material, length of the sample gas line and sample probes as well as the selected measuring range, this time period can be up to a week.

#### Ready for measurement

Once the warm-up phase is complete, the gas analyzer is ready to begin the measurement process.

When the minimum working temperature has been attained, the external sample gas valve opens automatically and allows the connection of the test or sample gas.

#### Connecting the sample gas

The sample gas valve is automatically opened by the gas analyzer when the detector temperatures reaches 150 °C and the sample gas is then sucked in.

#### Check sample gas flow rate

The sample gas is supplied to the gas analyzer in depressurized state with an excess.

The sample gas flow rate then depends on the atmospheric pressure, length of the sample gas line and the pressure at the sampling point.

A sample gas flow rate of 80 to 100 l/h, with atmospheric pressure (1000 hPa) can be assumed.

The sample gas flow rate can be read off in the 'Diagnostic/Information / Module specific / Auxiliary raw values' menu.

#### Checking the calibration

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.

It is therefore recommended that the calibration of the gas analyzer be verified at the installation site.

#### Checking date and time

Setting the correct date and time is a prerequisite for the correct functioning of the automatic calibration and for the correct entry times of the status messages in the logbook.

1. Select menu item 'Date/Time':  
'MENU / Configure / System / Date/Time'
2. Check the date and time and correct as necessary.

#### Note

The gas analyzer is set to the time zone GMT+1 at the factory.

## Fidas24 – Standby/Restart

### Menu Path

'MENU / Maintenance/Test / Analyzer spec. adjustm. / Standby/Restart FID'

| Parameter    | Value      |
|--------------|------------|
| F-D1         | 229.2 C    |
| Ignition no. | successful |
| Status       | Measuring  |
| C-Air        | 800.1 hPa  |
| C-Gas        | 1180.1 hPa |

<STANDBY> to invoke standby mode.  
<STANDBY & PURGE> standby & zero gas purge.

A V STANDBY STANDBY & PURGE

### Display of the operating condition of the Fidas24

The key operating data of the Fidas24 are displayed:

| Parameter    | Description   |
|--------------|---|
| Flame 1      | Indication of the flame temperature.  |
| Ignition no. | Indication of the number of ignition attempts before the flame is ignited. The "successful" display means that the first ignition attempt was successful.   |
| Status       | <ul style="list-style-type: none"> <li>Measuring: The analyzer module is OK, the measurement is running.</li> <li>Standby: The analyzer module is in standby mode; the measured values are invalid.</li> <li>Flame-Error: The flame is deactivated; the analyzer module needs to be restarted.</li> <li>Fail safe: The analyzer module has been deactivated due to a severe error.</li> </ul> |
| Air Pr.      | Indication of combustion air pressure   |
| H2           | Indication of combustion gas pressure   |

### Definition of statuses

Standby mode means:

Heater on, combustion gas valve closed, combustion air valve closed, sample gas inlet valve closed, housing purging on, zero gas valve opened in standby mode with purging of the detector.

Fail-safe status:

Heater off, combustion gas valve closed, sample gas inlet valve closed, housing purging on, zero gas valve open.

### Putting the Fidas24 in standby mode

If in the 'Standby/Restart FID' menu, the 'Standby' or 'STANDBY & PURGE' softkeys are displayed, the Fidas24 can be set to standby mode:

| Softkey         | Description/function  |
|-----------------|---|
| Standby         | Standby mode is activated.  |
| STANDBY & PURGE | Standby mode with opening of the zero gas valve for purging the detector is activated (only when executing with test gas connection). |

### Setting the Fidas24 back to the measuring mode (restart)

If the Fidas24 is restarted from standby mode or after a flame error, in the 'Standby/Restart FID' menu, the 'Restart' softkey is displayed:

| Softkey | Description/function    |
|---------|-------------------------|
| Restart | Restart is carried out. |

After initiating the restart, you can leave the menu via the **Meas** or **Back** keys; the restart sequence continues to be executed.

The restart sequence can, however, also be observed further in the menu. The current values for the flame temperature, the combustion air pressure and the combustion gas pressure as well as the number of ignition attempts are displayed.

If the flame still fails to ignite after 10 attempts at ignition, the 'Ignition no.' parameter will display the text '10 - failed'. You can initiate a restart of the system by pressing the 'Restart' softkey.

## ... 9 Commissioning

### ... Fidas24 – Standby/Restart

#### Fidas24 in fail-safe status

If a fatal error occurs in the analyzer module, the analyzer module will be set to the fail-safe state; in the 'Standby/Restart FID' menu, for the 'Status' parameter, the text 'Fail safe' will be displayed.

The cause of the failure must be determined from the status messages, refer to "Diagnosis / error messages" in the operating instruction.

A cold restart in the menu is not possible; after fault correction the gas analyzer must be cold restarted by switching off and on again.

### Checking gas path leak tightness

Checking the sample gas path under negative pressure:

1. Connect zero gas at the sample gas inlet.
2. Shroud all joints successively with a small cloud of a gas that contains hydrocarbons (e.g. with a cold spray or a test gas that contains hydrocarbons, or a cloth soaked in acetone).
  - Observe the measured value display; if the measured value changes to a positive value, the relevant connection is **leaking**.

### Check the integrity of combustion gas path

#### Combustion gas line

The seal integrity of the combustion gas feed line must be regularly checked in accordance with the two following instructions, depending on whether the combustion gas is offered from a bottle or a central supply.

#### Combustion gas supply from a cylinder

1. Switch off the gas analyzer power supply. Ensure that the shut-off valve in the combustion gas supply line is open.
2. Set the combustion gas pressure at 1.1 x the normal pressure of the combustion gas, i.e. at approx. 1.4 bar.
3. Mark bottle pressure display on the high-pressure manometer.
4. Close the valve of the combustion gas bottle.
5. Observe the display on the high-pressure manometer – it should not change measurably in 10 minutes.
  - A measurable change in the display is an indication of a leak in the combustion gas path between the bottle pressure reducer and the combustion gas inlet valve of the gas analyzer.
 

In this case the following measures are to be taken:

    - Check the combustion gas line between the bottle and gas analyzer with a leak detection spray. A leak in this area must be remedied and another leak test must be performed before the gas analyzer is put into operation again.
    - If no leak is found, that means the gas analyzer combustion gas inlet valve is leaky.

### DANGER

#### Explosion hazard

Explosion hazard if there is a leak in the combustion gas inlet valve.

If a leak is detected at the combustion gas inlet valve:

- Disconnect the combustion gas supply.
- Do not restart the gas analyzer.
- Have the combustion gas valve replaced by the ABB Service team.

6. After conclusion of the seal integrity test, set the combustion gas pressure to normal pressure again, i.e. 1.2 bar.

### Combustion gas supply from a central unit

1. Switch off the gas analyzer power supply. Ensure that the shut-off valve in the combustion gas supply line is open.
2. Set the combustion gas pressure at 1.1 x the normal pressure of the combustion gas, i.e. at approx. 1.4 bar.
3. Mark pressure indication on the manometer of the pressure reducer.
4. Shut off the combustion gas supply.
5. Observe the display on the manometer – it should not change measurably in 10 minutes.
  - A measurable change in the display is an indication of a leak in the combustion gas path between the pressure reducer and the combustion gas inlet valve of the gas analyzer.

In this case the following measures are to be taken:

  - Check the combustion gas line between the pressure reducer and gas analyzer with a leak detection spray. A leak in this area must be remedied and another leak test must be performed before the gas analyzer is put into operation again.
  - If no leak is found, that means the gas analyzer combustion gas inlet valve is leaky.

### DANGER

#### Explosion hazard

Explosion hazard if there is a leak in the combustion gas inlet valve.

If a leak is detected at the combustion gas inlet valve:

- Disconnect the combustion gas supply.
- Do not restart the gas analyzer.
- Have the combustion gas valve replaced by the ABB Service team.

6. After conclusion of the seal integrity test, set the combustion gas pressure to normal pressure again, i.e. 1.2 bar.

### Combustion gas path in the gas analyzer

### DANGER

#### Explosion hazard

Explosion hazard if there is a leak in the combustion gas path of the gas analyzer.

If a leak is detected in the combustion gas path within the gas analyzer:

- Shut down the gas analyzer and do not restart it under any circumstances.
- The cause of the leak must be determined and remedied by ABB Service.

### CAUTION

#### Risk of electric shock

Risk of electric shock during the leak tightness test.

The leak tightness test described in this section requires special training and under some circumstances involves working with the gas analyzer open and powered up.

- The leak tightness check may be carried out by qualified and specially trained persons only.
- If these conditions are not provided or the prescribed materials are not available, a seal integrity test must be carried out by ABB Service.

1. The gas analyzer must be in operation (flame on).
2. Inspection of combustion gas feed path with positive pressure (combustion gas inlet to combustion gas nozzle):
  - Check all connection points with a hydrogen detector (for example, based on thermal conductivity) for leakage of combustion gas.
    - The leakage rate may not up-scale  $2 \times 10^{-4}$  hPa l/s.
3. Inspection of the combustion gas feed path with negative pressure (in the detector, after the combustion gas nozzle):
  - Connect zero gas at the sample gas inlet.
  - Shroud all joints successively with a small cloud of a gas that contains hydrocarbons (e.g. with a cold spray or a test gas that contains hydrocarbons, or a cloth soaked in acetone).
    - Observe the measured value display; if the measured value changes to a positive value, the relevant connection is **leaking**.

# 10 Operation

## General

The AO2000 series gas analyzers have several user interfaces:

- The local operation user interface is the display and control unit on the gas analyzer ('local HMI').
- The remote operation user interface is a PC running the 'AO-HMI' software ('remote HMI'). For detailed information on remote operation, see the 'AO-HMI' technical bulletin.

### Note

The user interface is designated using the acronym 'HMI', which stands for 'human machine interface'.

### HMI priority

A gas analyzer (or more accurately an analyzer module) can only be operated via one HMI.

The password hierarchy controls which HMI has or retains priority for operation (refer to the following table).

As a rule, the HMI with the level n+1 password has priority over an HMI with the level n password. An exception is the local HMI with level n password which has priority over a remote HMI with a level n password.

| 1st user:          | 2nd user:               |                        |
|--------------------|-------------------------|------------------------|
|                    | Remote HMI receives ... | Local HMI receives ... |
| Remote HMI level n | Priority with level n+1 | Priority with level n  |
| Local HMI level n  | Priority with level n+1 | —                      |

### Note

If a second user with an HMI receives priority over another HMI, all first user input not confirmed with the 'ENTER' key is lost and processes in progress (e.g. calibration) will be stopped.

### Specifics for manual calibration

Manual calibration runs at level 0, thus no password is needed.

It is protected in the following manner from being stopped by another HMI.

On entering the **Calibrate** menu the level 1 password is automatically assigned.

Therefore, any other HMI must at least enter a level 2 password in order to assume priority for operation. In this event the calibration run would be stopped.

### Access lock

Independent of the user interface priority adjustment it is possible to completely lock the access to the operation of the gas analyzer from a certain user interface (HMI).

This lock is effected by configuration of the function block 'Access lock'.

The Technical Information 'Function Blocks – Descriptions and configuration' contains complete information on the individual function blocks.

### Access denied

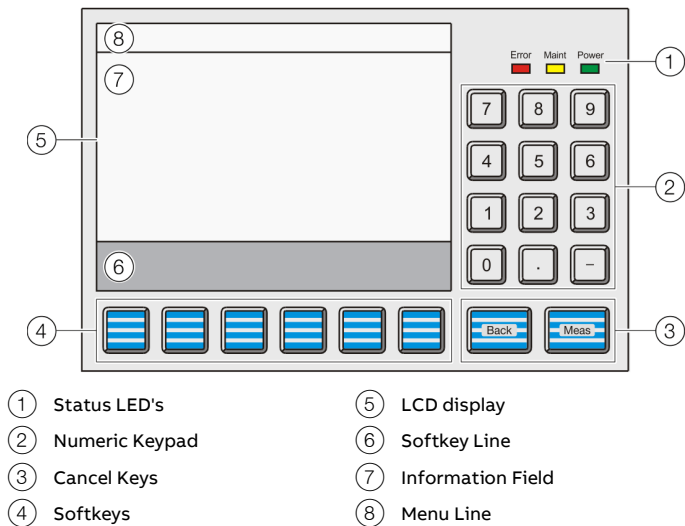
When a user tries to operate the gas analyzer via a locked HMI, the following text is displayed after pressing the 'MENU' key:

**ACCESS DENIED !**  
**The operation of the analyzer unit is not permitted at this time.**  
**Cancel: <BACK>**

### Access lock via password protection

As an alternative to the above-described complete access lock it is possible to inhibit entering the main menu and thus switching to the menu mode via password protection, see **Password protection** on page 70.

## LCD indicator



- |                  |                     |
|------------------|---------------------|
| ① Status LED's   | ⑤ LCD display       |
| ② Numeric Keypad | ⑥ Softkey Line      |
| ③ Cancel Keys    | ⑦ Information Field |
| ④ Softkeys       | ⑧ Menu Line         |

Figure 25: LCD indicator

The LCD indicator is located on the front face of the system housing.

### Menu levels of the LCD indicator

The LCD indicator operating modes have no effect on measurement operations, i.e. gas analyzer measurement functions continue while in menu mode.

### Measurement mode

In the measurement mode the LCD display shows the actual process values.

### Menu mode

In menu mode the LCD display shows the menu or individual menu items or parameters with the applicable values, as well as operator prompts.

### LCD display

The backlit graphics has a 320 x 240-pixel resolution. The screen is divided into three panels:

- Menu line
- Information field
- Softkey line

#### The menu line

The menu line appears at the upper edge of the screen. A line separates it from the information field.

It shows the current menu path and thus allows the operator to see where the system is in the menu tree. Additionally it shows the name of the analyzer being processed.

#### The information field in measurement mode

In the measurement mode the information field shows the following information for each sample component in the analyzer modules installed in the gas analyzer:

- Values in numeric form and as a bar graph
- The physical unit for the measured value
- The measurement component designation
- The measurement range lower and upper limit values on the horizontal bar graph
- The analyzer type
- The analyzer name

Values from up to six sample components can be displayed simultaneously.

It is user-configurable which measurement values are shown on the screen and at which positions on the screen the measurement values are displayed.

## ... 10Operation

### ... LCD indicator

In addition, the user can configure display elements that allow to:

- Enter values, see Operating instruction.
- Actuate keys, see Operating instruction.

#### Note

For further information about the screen in the measurement mode refer to Operating instruction.

#### The information field in menu mode

In menu mode the information field contains the menu or individual menu items or parameters with the applicable values, as well as operator prompts.

#### The softkey line

The softkey line appears at the lower edge of the screen. Its gray background distinguishes it from the information field.

The softkeys are further explained in **Softkeys** on page 65.

#### Display of status messages

The softkey line also displays messages from the gas analyzer. The blinking message display in the softkey line has the following functions:

- It prompts for the **'STATUS MESSAGE'** key to be pressed whenever a status
- It shows that a password is active.
- It shows that the gas analyzer is being controlled from a remote HMI.
- It shows that an automatic calibration process is running in the gas analyzer.




#### Display of status messages

When a status message is generated by the 'Message insert' function block its short text is displayed on the message display as configured in the function block.

The Technical Information 'Function Blocks – Descriptions and configuration' contains complete information on the individual function blocks.

#### Status LEDs

The three LEDs next to the screen show the user the gas analyzer's status.

| Status LED   | Description  |
|--|--|
| <br>Power | The green 'Power' LED lights when the power supply is on.  |
| <br>Maint | <p>The yellow 'Maint' LED lights when the 'Maintenance request' status signal is active.</p> <p>The 'STATUS MESSAGE' softkey appears on the screen at the same time.</p>               |
| <br>Error | <p>The red 'Error' LED lights when the 'Failure' status signal or the overall status signal is active.</p> <p>The 'STATUS MESSAGE' softkey appears on the screen at the same time.</p> |

#### Note

For detailed information on status messages and status signals refer to **Display of status messages** on page 64.



### Numeric keypad

The numeric keypad is located to the right of the screen, under the status LED's.

### Numerical entry

Numerical values can be entered directly with the numeric keys '0 to 9', the decimal point key '.' and the minus sign '-'.

### Examples:

Test gas concentration, Date and time, Air pressure, Password

### Note

Any digits displayed cannot be overwritten directly. They must be deleted with the 'BACKSPACE' or 'CLEAR' key before new digits can be entered.



### Entering text with the numeric keypad

The numeric keypad is also used to enter texts, such as sample component or user names.

Refer to **Entering text** on page 66.

### Cancel keys

The 'Back' and 'Meas' buttons located under the numeric keypad are designated as cancel keys.

| Button   | Description   |
|--|---|
|  | <p>The 'Back' key allows the operator to cancel a function or menu item and return to the previous menu level.</p> <p>Only entries confirmed with the 'ENTER' softkey are stored; unconfirmed items are not accepted.</p> <p>The 'Back' button also allows the operator to clear gas analyzer help text and messages.</p> |
|  | <p>The 'Meas' button allows the operator to cancel a function or menu item and to return to the measured value display in measurement mode.</p> <p>Only entries confirmed with the 'ENTER' softkey are stored; unconfirmed items are not accepted.</p>  |

### Note

The gas analyzer automatically reverts to the measurement mode to display values if the operator has not pressed a key in menu mode in the last five minutes ('time out').

### Softkeys

The six buttons under the screen and the softkey line at the lower edge of the screen are known as softkeys.

A softkey is the combination of the button and its designation in the softkey line.

A softkey does not have any set function, but is assigned a function for a given situation as shown in the softkey line of the screen.




Pressing a softkey is the equivalent of pressing the button assigned to the function; this process is illustrated by the quasi-three-dimensional softkey representation on the screen.

Softkeys are also called buttons in this operating instruction.

### Softkeys in Measurement Mode

In measurement mode, the softkey line contains the 'MENU' and '>>' softkeys.

The 'STATUS MESSAGE' softkey also appears if an error occurs.

| Softkey   | Description   |
|---|---|
|    | The 'MENU' button is used to call up the main menu and switch to menu mode when in measurement mode.  |
|   | <p>The '&gt;&gt;' button allows the operator to scroll to the next display page.</p> <p>This button only allows forward scrolling.</p> <p>The 'Back' button is used for backward scrolling.</p>   |
|  | <p>The 'STATUS MESSAGE' button is displayed in measurement mode if the 'Failure' or 'Maintenance Req.' status is pending.</p> <p>This button allows the operator to call up the status message summary and view the status messages.</p> <p>The user can also call up a detailed display for any message in the log.</p> <p><b>Note</b></p> <p>For detailed information on the possible status messages and status signals, see <b>Display of status messages</b> on page 64.</p> |









## ... 10Operation

### ... LCD indicator

#### The Softkeys in Menu Mode

In menu mode, a series of softkeys appears on the softkey line, whose labeling and therefore function change based on the situation.

Their descriptions and functions depend on the specific situation.

| Softkey  | Description  |
|--|--|
|    | The operator uses the arrow keys to move the selection cursor up or down, e.g. in menus or lists to choose vertically arranged (menu) items.   |
|    | The menu item selected is reversed, i.e. appearing as bright characters on a dark background.  |
|    | The operator uses the arrow keys to move the selection cursor left or right, e.g. into or out of a submenu or to select (menu) items arranged next to each other.  |
|    | The menu item selected is reversed, i.e. appearing as bright characters on a dark background.  |
|    | The operator can use the <b>'BACKSPACE'</b> button to delete characters to the left of the cursor (as on a PC keyboard).   |
|   | The operator can use the <b>'CLEAR'</b> button to delete all characters in a selected field.   |
|  | The operator can use the <b>'ENTER'</b> button to call up menu items for editing, trigger functions, confirm inputs, e.g. parameterization.<br>The <b>'ENTER'</b> button is always at the right margin of the softkey line.          |
|  | The operator can use the <b>'HELP'</b> button to access context-sensitive help. The screen will then show a help message explaining the menu item selected.<br>The operator can use the <b>'Back'</b> button to clear the help text. |

#### Presentation of entries in this Commissioning Instruction

In this operating instruction, entries to be made by the operator will not be identified by key symbols but by the following type styles (these are examples only):

Press cancel keys:

**'Back', 'Meas'**

Press softkeys:

**„MENU“, „HELP“, „ENTER“, „BACKSPACE“**

Select menu items:

**„Calibration Data“, „Configure“**

Enter numbers:

**'0' to '9'**

#### Entering text

When text, such as sample components or user names, needs to be entered an 'image' of the numeric keypad appears on the screen.

The following characters are shown using a total of four pages:

- Letters A to Z and a to z
- Special characters \* ( ) % & : < > / and spaces
- Digits 0 to 9

Each character is accessed using the button in the corresponding position on the numeric keypad. Examples:

|          |   |   |   |                          |
|----------|---|---|---|--------------------------|
| Letters: | A | L | t | Blank or space character |
| Button:  | 7 | - | 2 | 9                        |





An input line appears at the lower edge of the screen for new text to be entered or existing text to be modified.

Text is entered and modified in two ways:

- The operator enters text in input mode.
- The operator modifies already entered text in edit mode.



#### Softkeys in input mode

The softkeys in the input mode have the following functions:

| Button  | Description   |
|---|---|
|  | The <b>'PREV PAGE'</b> and <b>'NEXT PAGE'</b> buttons allow the operator to move to the previous or next keypad page. |
|  |   |
|  | The <b>'CAPS'</b> button allows the operator to switch between uppercase and lowercase letters.                       |
|  | The <b>'EDIT'</b> key allows the operator to switch into edit mode.   |

### Softkeys in Edit Mode

The softkeys in the edit mode have the following functions:

| Button   | Description  |
|--|--|
|  | The two arrow keys allow the operator to move the cursor left and right in the entry line.                                 |
|  |  |
| BACK-SPACE   | The operator can use the ' <b>BACKSPACE</b> ' button to delete characters to the left of the cursor (as on a PC keyboard). |
| INPUT  | The ' <b>INPUT</b> ' button allows the operator to switch to entry mode.   |

## ... 10Operation

### Selecting and changing parameters

#### Value Input

Numeric and alphanumeric parameter values can be entered directly via the keyboard using the value input.

Numbers on the keyboard are assigned to the individual parameters; the assignment is specified above the respective parameter (e.g.: 'Press key <4>').

The parameter is called up for editing by pressing the assigned number key.

#### Example

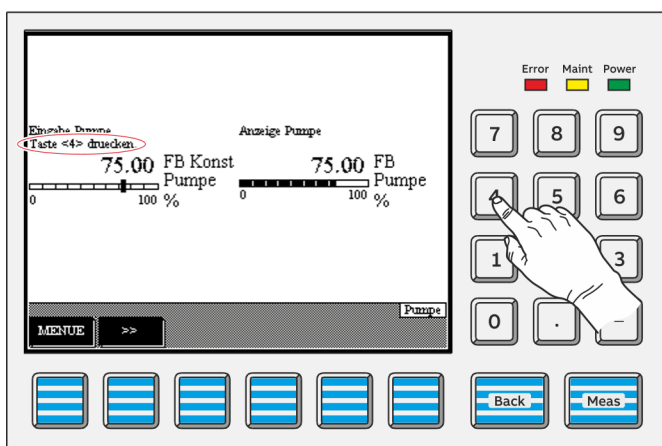


Figure 26: Select parameters (Example)

1. Press the '4' button to call up the parameter for editing.

- The LCD display will now display an entry field to change the parameter value.

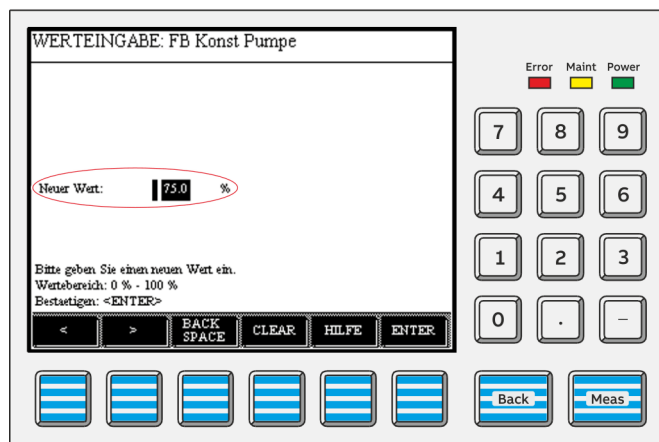


Figure 27: Change parameter value (Example)

2. Enter the new value using the numeric keypad and then press the 'ENTER' to accept it.

#### Setup

The value input can be configured individually on the user pages, for detailed information, see Operating instruction.

## Key Entry

Using the key entry, preset parameter values can be selected directly using the softkeys.

Numbers on the keyboard are assigned to the individual parameters; the assignment is specified above the respective parameter (e.g.: 'Press key <4>').

The parameter is called up for editing by pressing the assigned number key.

### Example

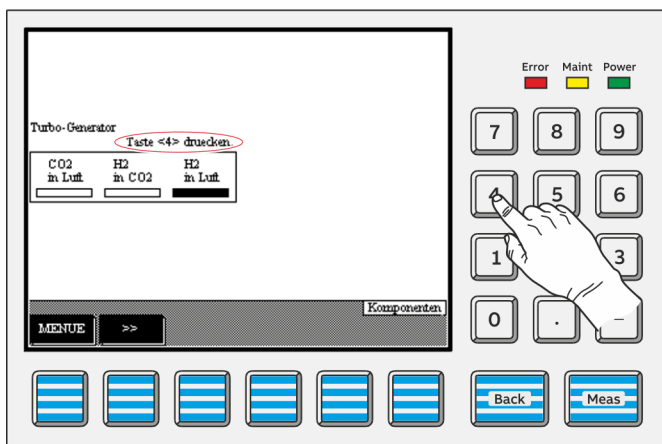


Figure 28: Select parameters

1. Press the '4' button to call up the parameter for editing.

- The LCD display now shows the softkeys for selecting the parameters for changing the parameter value.

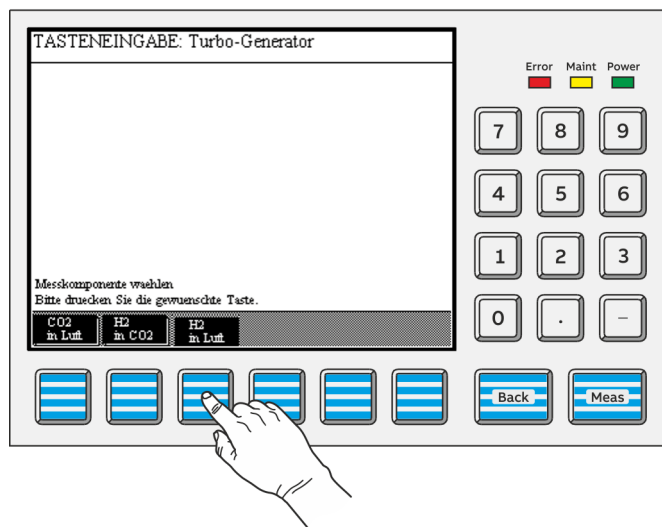


Figure 29: Select parameter value

2. Select the new value using the corresponding softkey.

### Setup

The key entry can be configured individually on the user pages, for detailed information, see Operating instruction.

## ... 10Operation

### Password protection

Password protection consists of three elements:

- Password level,
- User group and
- Password.

#### Password Level

Each menu item is assigned a password level. Password levels are numbered with 0, 1, 2 and 3.

Menu items are assigned to different password levels in order to assure that specific menu items can only be changed by authorized users.

#### User Group

The definition of a user group is that every user that belongs to it has access entitlement at certain password levels, i.e. can make changes to the menu items at these levels.

Some user groups are set-up at the factory.

A user group can be made up of one or more users.

#### Password

##### **NOTICE**

##### **Damage to the configuration of the gas analyzer.**

After entering the password for password level 3, you can access all of the function block applications!

- Make sure that changes in password level 3 are only made by appropriately trained personnel.

#### Note

The 'Function Blocks – Descriptions and Configuration' Technical Information contains complete information on the 'Function Block' concept as well as detailed descriptions of the individual function blocks.

Every user group set-up in the system has a password. The password consists of six digits which can be entered via the numeric keypad.

#### Factory setting

Passwords are pre-assigned for the factory-set user groups.

| User Group                | Access to password levels | Password |
|---------------------------|---------------------------|----------|
| Every user                | 0                         | None     |
| Maintenance team          | 0, 1                      | 471100   |
| Specialist team           | 0, 1, 2                   | 081500   |
| Function block specialist | 0, 1, 2, 3                | 325465   |

#### Viewing Menu Items

All users can view all menu items, regardless of password level, without entering a password.

#### Changing Menu Items

All users can make changes to password level 0 menu items without entering a password.

Password level 1, 2 and 3 menu items can only be changed if the user belongs to the group authorized for that level and after the user's password has been entered.

#### Note

Entering the main menu and thus switching to the menu mode can be password protected, refer to **Access lock** on page 62.

#### Change Privilege

After entering the password the user is authorized to change any menu items on all password levels accessible at the user's level.

### Duration of the change privilege

The change privilege remains in place until

- either the gas analyzer automatically switches to measuring mode if the user does not actuate a button for about five minutes ('time-out'),
- or the user presses the 'MEAS' key twice in a row.

If the user presses the 'MEAS' key only once to switch back to measuring mode, the change privilege initially remains in place. This is signaled by the flashing 'Password active' message display.

In this way, the user does not need to enter the password again before changing the menu items when switching back to menu mode within the following approx. five minutes.

### Note

The change privilege therefore refers to the time-limited authorization to make changes to the menu items.

By contrast, the access right designates the principle authorization defined by per configuration to make changes to the menu items at certain password levels.

### Change password

Refer to Operating instruction.

## 11 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.
- Turn off the power supply before opening the device, and observe a waiting period of 20 minutes, in order to allow any hot components to cool down.

#### **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 require 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 !

### 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 19.

### Note

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

## 12 Decommissioning

### 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.
- Turn off the power supply before opening the device, and observe a waiting period of 20 minutes, in order to allow any hot components to cool down.

#### CAUTION

##### Injury hazard due to heavy weight

The gas analyzer weighs approx. 30 kg!

- Two persons are required for unpacking and transportation!

### Decommissioning the gas analyzer

#### In the case of a temporary shutdown:

1. Shut off the sample gas supply at the sampling point.
2. Purge the sample gas line with nitrogen for at least 5 minutes, from the sampling point.
3. Set the gas analyzer to standby mode, refer to **Fidas24 – Standby/Restart** on page 59.
4. Shut off combustion air supply and combustion gas supply.

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

5. Shut off instrument air supply.
6. Switch off the gas analyzer power supply.
7. Remove the gas lines from the gas analyzer ports. Tightly seal the gas ports.
8. Disconnect the electrical leads from the gas analyzer.

### Packing the Gas Analyzer

1. Tightly seal the cable gland of the connection box by inserting small plates.
2. Remove adapters from the gas ports and tightly seal the gas ports.
3. 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).
4. 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.
5. 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 the information in **Returning devices** on page 19!

#### Transport-/Storage temperature

-25 to 65 °C



## 13 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.

## 14 Specification

### Note

The device data sheet is available in the ABB download area at [www.abb.com/analytical](http://www.abb.com/analytical).

### Note regarding the analyzers performance characteristics

- The metrological data of the analyzers is 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.

## 15 Additional documents

### Note

All documentation, declarations of conformity, and certificates are available in ABB's download area.

[www.abb.com/analytical](http://www.abb.com/analytical)

## 16 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 more product information, visit:  
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