

# Chemiluminescence Detection Gas Analyzer - XECLD X-STREAM Enhanced Series

## Instruction Manual



**ROSEMOUNT™**



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## Essential instructions

Emerson Rosemount designs, manufactures and tests its products to meet national and international standards. Because the products are sophisticated technical products, you **MUST** properly install, use, and maintain them to ensure they continue to operate within their normal specifications. The following instructions **MUST** be adhered to and integrated into your safety program when installing, using and maintaining Emerson Process Management (Rosemount Analytical) products. Failure to follow the proper instructions and operating the Analyzer outside the boundaries specified in this manual may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, contact your Emerson Automation Solutions (Rosemount) representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes.
- Connect all products to the proper electrical power and gas supplies.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified personnel use replacement parts specified by Emerson Process Management (Rosemount Analytical). Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and **VOID YOUR WARRANTY**. Non-original substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

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## 1 Safety Instructions

### 1.1 Symbols Used On and Inside the Unit

#### 1.1.1 Housing Signage

##### Nameplate

##### All configurations

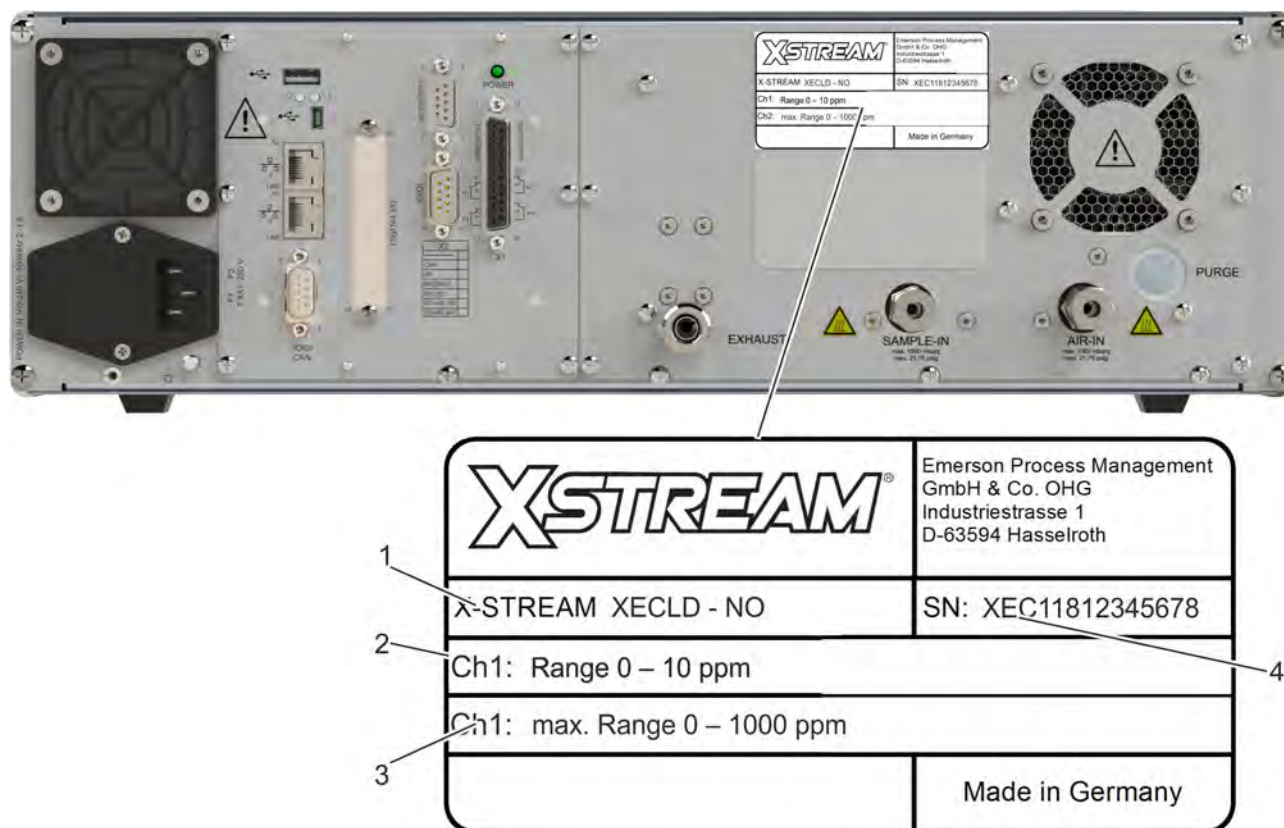


Fig. 1: Nameplate

- |                                      |                                              |
|--------------------------------------|----------------------------------------------|
| 1 Product type                       | 3 Channel 1: Maximum measurement range (ppm) |
| 2 Channel 1: Measurement range (ppm) | 4 Serial number                              |

The nameplate (Fig. 1) is located on the rear panel. It contains information about the exact configuration of the analyzer.

##### Back panel

##### All configurations



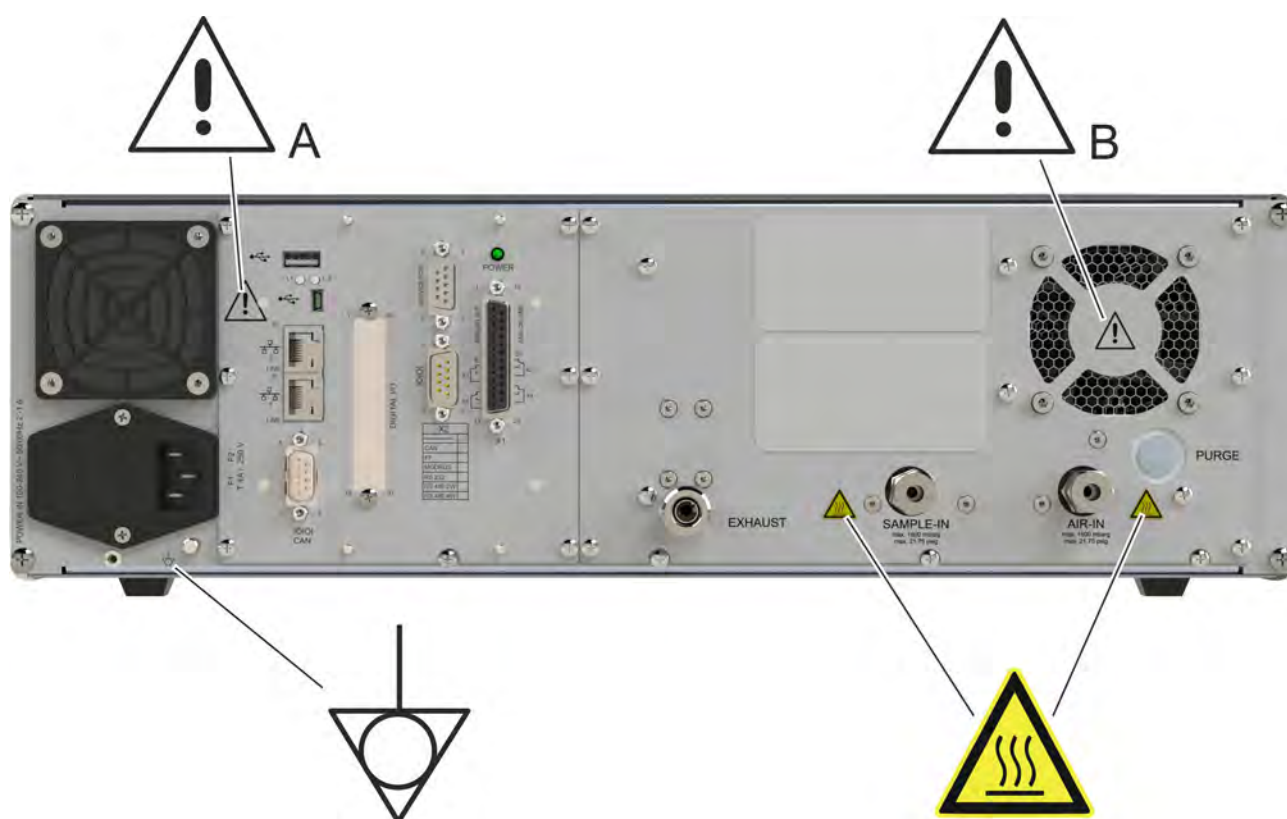



Fig. 2: Signage (backpanel)

On the back panel the signage shown in (Fig. 2) indicates dangerously hot surfaces, rotating fans and a separate connector for protective earth.

Sign	Meaning
	<b>Hot Surfaces!</b> First turn off the device and let it cool down for approx. 30 min before touching the marked parts.
 A	<b>Possible contact with Electricity!</b> Never touch live parts (e. g. damaged cables) and only remove any covers on the backpanel as described in this manual.
 B	<b>Rotating Fan!</b> Never insert body parts or other objects into the marked fan-openings.

Sign	Meaning
	<p>Equipotential bonding connector.</p> <p>On-site equipotential bonding should be connected at the marked position.</p>


## Top Cover

### All configurations



Fig. 3: Signage (top cover)

On the backside of the top cover a sign with a warning regarding a potential electrical hazard (Fig. 3, top right) is attached.

Sign	Meaning
	<p>Electrical Shock!</p> <p>Always disconnect power before opening the housing.</p> <p>Never open the top cover or any panel with power plugged in.</p>

## 1.1.2 Signage Below Covers

### Module Cover

#### All configurations



The module cover is only visible after removing the top cover.

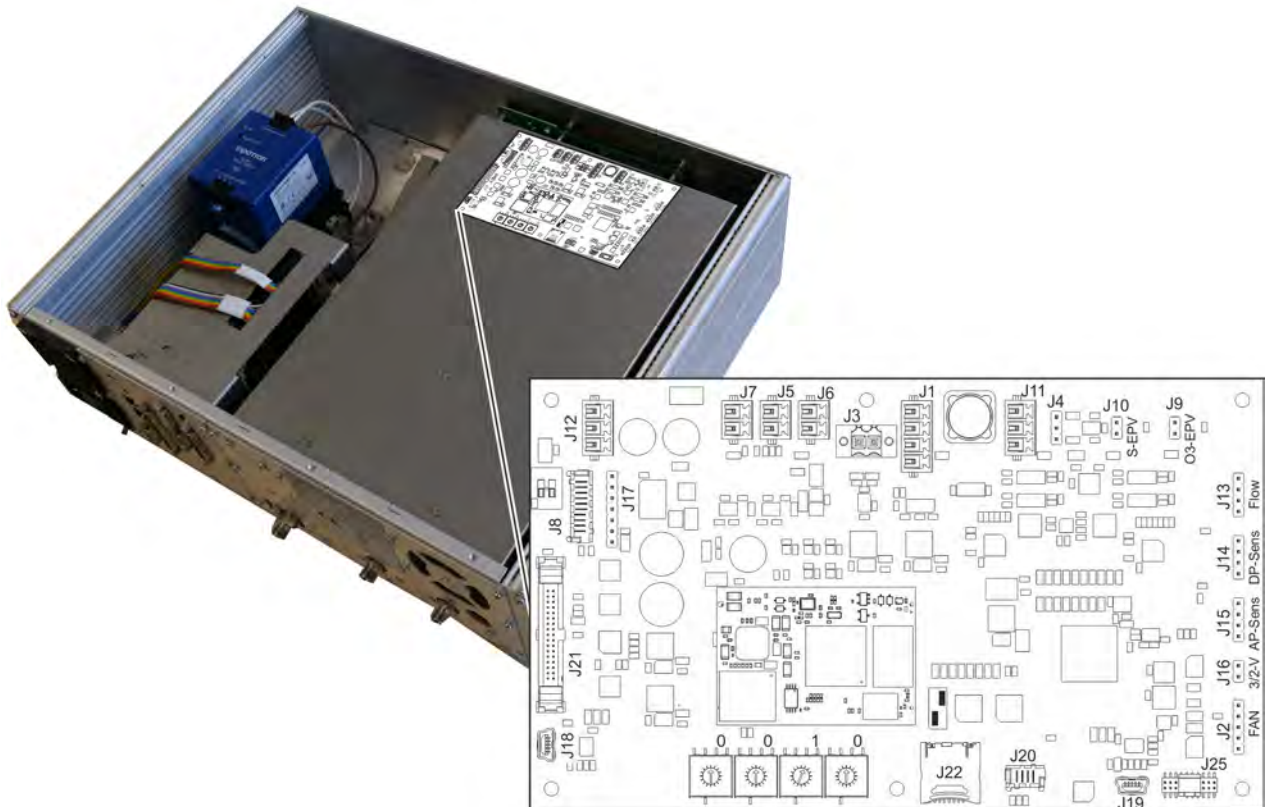


Fig. 4: Signage (module cover)

On the module cover, a sign showing a schematic drawing of the XECLD Personality Board at the front end of the module with marked connectors is attached.

The upper part of the displayed circuit board is accessible after removing the module cover.

### Converter Cover and Ozonator

#### All configurations



Converter cover and ozonator are only visible after removing the module cover.

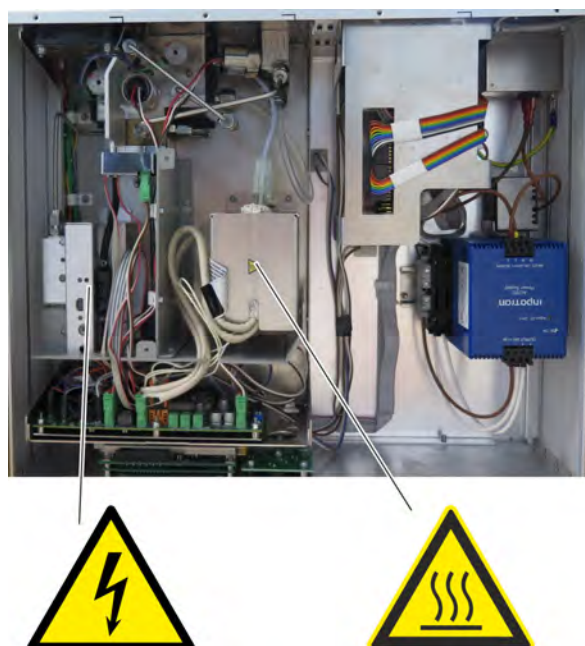


Fig. 5: Signage (converter cover)

After removing the module cover, the converter cover becomes accessible.

Signage on the ozonator indicates high voltage (Fig. 5/left). Signage on the converter cover indicates hot surfaces (Fig. 5/right).

Sign	Meaning in product context
	<p>High Voltage!</p> <p>The ozonator works with high voltage which can result in electric shocks.</p> <p>Never open housing with analyzer connected to power supply.</p>
	<p>Hot Surfaces!</p> <p>Converter case may heat up to 75 °C (170 °F).</p> <p>Always wear safety gloves when handling converter case or surrounding parts.</p> <p>Measure temperature and let the surface cool down before touching.</p>

## 1.2 Symbols Used in this Manual

### Safety Instructions

Safety instructions in this manual are identified by symbols. The safety instructions are introduced by signal words which express the extent of the hazard.



### DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



## WARNING!

WARNING indicates a hazardous situation which, if not avoided, *could* result in death or serious injury.



## CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



## NOTICE!

NOTICE indicates important, non-safety-related information, such as property and environmental damage.

### Safety Instructions in Procedural Instructions

Safety instructions can refer to specific, individual procedural instructions. Such safety instructions are embedded in the procedural instructions so that they do not interrupt the reading flow when performing the activity. The signal words described above are used.

Example:



## WARNING!

**Check temperature before touching heater jacket. If too hot let it cool down!**

Carefully pull out heater jacket in the direction of the rear panel.





### Tips and Recommendations



*This symbol highlights useful tips and recommendations, as well as useful information for efficient and fault-free operation.*

### Identifiers in this Manual

To highlight procedural instructions, results, lists, references, and other elements, the following identifiers are used in this manual:

Identifier	Explanation
	Step-by-step procedural instructions
	Results of procedural steps
	References to sections of this manual and to other applicable documents
	Lists without a defined sequence
[Button]	Controls or signals (e.g., display elements or signal lamps)
"Display"	Screen elements (e.g., buttons, assignment of function keys)

## 1.3 Intended Use Statement


### Intended Use

The X-STREAM Enhanced Chemiluminescence Detector (XECLD) is an analyzer intended for measurement of NO/NO<sub>2</sub>/NO<sub>x</sub> concentrations in exhaust fumes and clean gas mixtures.

The analyzed exhaust fumes may come from all possible types of power plants with burning processes or from combustion engines.

Furthermore, the XECLD can be used for gas purity measurements.

In principle, the XECLD is fit for analyzing non-flammable gases and can be set up as a tabletop unit or as a rackmount device.

The XECLD may only be supplied with power and gases and be operated in surroundings as specified in this manual ( Chapter 3.1 "Housing Data, Connection Data, Environmental Conditions and Emissions" on page 43).

The Analyzer is intended for commercial use in industrial or non-industrial sectors. The intended use is limited to measuring and testing where usage in laboratories is included.



## Dangerous Misuse

### **WARNING!**

#### **Danger of injury and material damage due to misuse!**

If the device is not used as intended, dangerous situations may occur. Material assets may be damaged.

- Never use in unventilated locations.
- Only supply Analyzer with gases as described in this manual ↪ *Chapter 3.1.4 “Gas Supply Data” on page 46.*
- Make sure that gas connections are never unintentionally swapped.
- Always check gas connections and tubings for leakage as described in this manual ↪ *Chapter 9.9 “Performing a Leakage Test” on page 187.*
- Only operate the Analyzer within the boundaries specified in this manual ↪ *Chapter 3 “Technical Data” on page 42.*
- Always check additional operating boundary restrictions due to individually ordered configurations.
- The Analyzer may only be operated indoors in water and dust-protected environments. Use only in explosion-protected areas.

## 1.4 Authorized Personnel

### Special Training

Authorized personnel who install, operate, service and maintain the analyzer need to be fully instructed and trained. Authorized personnel who install, operate, service and maintain the analyzer need to be fully instructed and trained by the qualified personnel of the operating company and the manufacturer.

### Required Qualifications

The following job titles will appear in this manual allocated to procedures for which they are qualified:

Always make sure that only personnel that meet the special requirements as described in the following paragraphs are assigned to the described tasks.

### Analyzer operator

The Analyzer operator is qualified to perform basic tasks that do not require the opening of the Analyzer housing or the use of tools.

The Analyzer operator is trained in safety matters, on-site special features, regulations on-site and basics of gas measuring in a way that meets legal and other official requirements to work with the Analyzer.

Due to personality, experience and education, the Analyzer operator is capable of working in such a way as to keep all personnel in the industrial or laboratory environment safe.

### Authorized service personnel

Authorized service personnel are trained and authorized by Emerson Rosemount to perform specific service related tasks on the Analyzer.

Authorized service personnel have been extensively trained to understand the Emerson exhaust measuring product lines and have acquired deep knowledge about local safety regulations and technical standards during previous roles or training. The knowledge and experience gained enables these authorized service personnel to identify and avoid potential danger for themselves and others.

### Laboratory researchers

Laboratory researchers have a locally recognized university diploma (Bachelor's degree equivalent or higher) qualifying them to analyze automotive and industrial exhausts. Laboratory researchers have, in the scope of their activities, already gained experience in working with technical laboratory equipment (measuring and monitoring devices). Laboratory researchers are familiar with locally applicable safety regulations and guidelines for working in a laboratory setting.

Due to their professional experience and their analytical, methodological and technical knowledge gained through their studies, laboratory researchers are able to safely perform the following tasks with valid results:

- Erecting safe measurement setups with regard to the state-of-the-art.
- Designing, evaluating and interpreting a series of tests.
- Adapting parameters of the measurement setup in a targeted manner.

The Analyzer-specific knowledge and skills of the laboratory researcher exceed or at least match those of an on-site service technician. Therefore Laboratory researchers may perform all Analyzer-related tasks, an on-site service technician is required for.

## On-site service technician

The on-site service technician is assigned by the operator to perform service tasks that may involve opening the Analyzer housing.

On-site service technicians are also capable of performing comprehensive repair work which demands manual dexterity and a high level of mechanical or technical qualification. This qualification enables the on-site service technician to for example handle fasteners, sheet metal parts, electrical components and fragile components.

On-site service technicians are trained, have the expertise, and have familiarity with all applicable regulations to be able to complete the tasks entrusted to them. They are also able to independently, detect and avoid any possible hazards at the Analyzer itself or operation site.

## System integrator

Systems integrators are trained specialists, who are familiar with the interfaces provided by the Analyzer and its specification. System integrators are allowed to perform each and every action on the device in this manual and are able to connect the device to appropriate external systems for processing the counting data.

System integrators are familiar with the locally applicable safety regulations and guidelines for working in an industrial environment (for example a power plant or incineration facility) setting.

## 1.5 Personal Protective Gear

### Mandatory Protective Gear on Site

Only Analyzer-specific stipulations can be given in this manual regarding the protective equipment, since specific regulations on site are not known.

The required special protective equipment for working on site must be worn in addition to the protective equipment described in this manual. If the protective equipment described in this manual (for example safety gloves) is the same as in the operating instructions of other manufacturers, always wear the version which guarantees the higher standard of safety.

## Description of Protective Equipment

The following list describes all protective equipment that must be worn for working with the Analyzer. At the introduction of every step-by-step instruction, the specific protective equipment that is to be worn is listed.

### Safety gloves

Safety gloves are designed to protect the hands from friction, abrasions, puncture wounds or deeper wounds as well as coming into contact with hot surfaces.

### Safety shoes

Safety shoes protect against injuries of the feet due to falling or pointed objects, as well as against slipping.

Safety shoes exhibit the following characteristics:

- High skid resistance
- Steel caps as toe protection
- Strong upper material
- Puncture-resistant soles

Safety shoes must satisfy at least the applicable requirements of protection class 3 according to ISO 20345 or the requirements of other local regulations such as ASTM F2413-11.

## 1.6 Residual Risks

### 1.6.1 Unspecified Hazard

#### Unsuitable spare parts



#### WARNING!

#### Danger of injuries when using unsuitable spare parts!

If unsuitable spare parts are used, unforeseeable risks may arise. Fire, electrical shocks, gas poisonings, cuts or other injuries may be the result if unsuitable spare parts are used.

- Only purchase original spare parts from the manufacturer.
- Order only and exactly the spare parts listed on the spare parts list in this manual or a spare parts list provided by the manufacturer.

## 1.6.2 Electrical Hazard

### Electrical Shock

#### **DANGER!**

##### **Risk of death due to electric voltage!**

The Analyzer works from a mains voltage. Incorrectly handling the Analyzer or connecting cables can result in a fatal electrical shock.

- Do not operate Analyzer without secure covers.
- Do not open Analyzer whilst Analyzer is energized.
- Do not operate with damaged cables. Replace damaged cables immediately.
- Do not perform any tasks on mains-voltage-components. Use licensed electricians only!
- Never operate without a protective earth.
- Do not replace cables or other electrical components of the Analyzer on your own. Contact manufacturer.
- Never connect the power supply to any voltage other than that specified within the technical data ↗ *Chapter 3.1.3 “Power Connection Data” on page 45.*

### High Voltage Components

#### **WARNING!**

##### **Risk of electrical shock on high voltage components!**

The Ozonator works with high voltages. Touching the energized ozonator may result in an electric shock.

- Do not operate Ozonator without secure covers.
- Only allow authorized service personnel to perform tasks on the ozonator.
- Never open any cover while the Analyzer is connected to a power supply.

### Wrong Supply Voltage

#### **NOTICE!**

##### **Risk of damaged Analyzer when using wrong supply voltage!**

If the Analyzer is supplied with a voltage other than specified in this manual (↗ *Chapter 3.1.3 “Power Connection Data” on page 45*) it may be damaged irreparably.

- Only connect supply voltages as specified in technical data.

## 1.6.3 Chemical Hazard

### Harmful Gases

#### **WARNING!**

##### **Risk of poisoning by inhalation of ozone or exhaust fumes!**

The Analyzer is supplied with exhaust fumes and generates Ozone. Ozone is harmful to health and should not be inhaled in concentrations above the officially specified limits. Exhaust fumes may be poisonous.

- Only use the Analyzer in locations that have adequate ventilation that meet the local legal requirements.
- Test the gas tightness as described in this manual.
- Do not operate the Analyzer with a defective housing fans. Replace defective fan immediately.
- Treat exhaust gases only according to local regulations.
- Purge analyzer with nitrogen (N<sub>2</sub>) before opening housing and gas connections.
- Only open unpressurized Analyzers.



## 1.6.4 Fire and Burns Hazards

### Electrical Fire



#### **WARNING!**

#### **Fire hazard due to use of unsuitable fuses!**

If unsuitable fuses are used or fuses are bridged, electrical fires may occur.

- Only use fuses as described in this manual.
- Never bridge fuses. Never operate without fuses.

### Flammable Gases



#### **WARNING!**

#### **Risk of fire and explosion injuries!**

If the Analyzer is supplied with flammable gases fire and explosions may occur.

- Never supply the Analyzer with flammable gases.
- Always purge gas paths as described in this manual.

### Heated Components



#### **WARNING!**

#### **Risk of burns due to temperatures exceeding specification!**

Certain components can reach very high temperatures on their surfaces. Contact with these surfaces may cause burns:

Converter (Inner parts): 500 °C (930 °F)

Converter (Housing): 80 °C (176 °F)

Gas-Connectors: 75 °C (170 °F)

Module cover (top side): 90 °C (195 °F)

- Never operate with housing open.
- Never operate with a defective housing fan.
- Always switch off first and allow to cool for 60 minutes. Only when the Analyzer has cooled down:
  - Touch top cover.
  - Open housing.
  - Carry out work on the gas connections
- Follow the instructions in this manual exactly for activities inside the housing.
- Observe signage indications of hot surfaces.

## 1.6.5 Mechanical Hazards

### Falling Objects



#### **WARNING!**

#### **Risk of injuries caused by falling objects!**

If the Analyzer or any components fall (for example caused by mishandling), injuries may result.

- Always wear additional protective gear as described in this manual.
- Handle Analyzer and components with care.

### Sharp Edges and Corners

#### CAUTION!

##### **Risk of injuries at edges and corners!**

The rack mounting brackets protrude and bumping them may cause injuries; especially in transit. During activities inside the housing, contact with sharp-edged components is possible.

- When in transit, remove the mounting brackets.
- Only carry out activities within the housing in accordance with the instructions in this manual.

### Finger Injuries Caused by Fan

#### CAUTION!

##### **Risk of injury to fingers on the housing fan!**

If the finger protection is not reinstalled after working on the housing fan, crushing and impact injuries may result if fan is reached into.

- Always install finger protection as described.
- Never reach into the fan.

## 1.7 On the use of figures

### Product variants

The Analyzer is available in different variants and configurations. In this manual, a distinct configuration is shown which illustrates all tasks or information provided. In some sections however, the Analyzer configuration may differ. This will be more common in gas connector illustrations (for example, the existence of a purge connector or the connector type), the usage of optional I/O-cards and screw terminals, and in the distinction between rack mounting or the use of stand feet.

Please contact customer service if unsure some information does not apply to your configuration.

## 2 Technical Description

### 2.1 Tools and Consumable Materials

#### Tools

To work with the Analyzer, use a set of standard tools (for example, screwdrivers (cross-head and flat-head) and wrenches.

Additionally the following special tools are needed:

#### External hexagon nut with extension (5.5 mm)

The external hexagon nut with extension enables to unscrew hexagon socket nuts in an distance of approx. 20 cm (8 in).

The width across flat-head screwdrivers must be approx. 5.5 mm (0.22 in).

#### Consumable Materials

The following consumable materials are needed. Do not use other materials than these described:

##### Materials:

- Converter test gas supply
- Detergents
- Leakage test gas supply (N<sub>2</sub> or He)
- Replacement fuse
- Replacement housing filter
- Span gas supply
- USB storage device
- Zero gas supply (N<sub>2</sub>)
- Air-supply gas

#### Air-supply gas

Air-supply gas is pressurized or synthetic air and meets the technical requirements ↗ *Chapter 3.1.4 "Gas Supply Data" on page 46.*

Do not use pure oxygen as air-supply gas.

#### Converter test gas supply

Converter test gas has a known concentration of NO<sub>2</sub> (< 500 ppm) and meets the technical requirements.

A supply of converter test gas can be connected to the sample-in-line independently from sample gas or air supply.

#### Detergents

The detergent is not chemically aggressive, is free of solvents and does not contain any hydrocarbons.

#### Leakage test gas supply (N<sub>2</sub> or He)

A supply of test gas (N<sub>2</sub> or He) which can be connected to the exhaust line independently from sample gas or air supply (e. g. gas bottle).

The leakage test gas supply must be able to at least build up pressure of 1,034 hPa (15 psig) and must provide an option to shut down so that connected gas lines remain under pressure.

#### Replacement fuse

The replacement fuse matches the description and the technical data stated in the spare parts list in this manual ↗ *"Fuses" on page 227.*

#### Replacement housing filter

The replacement housing filter is available at Emerson Rosemount.

The filter fits into the seat at the air inlet at the rear of the housing and meets the requirements e. g. considering filtered particulate size.

Use replacement filters as listed on the spare parts list only.

#### Span gas supply

Span gas has a known concentration of NO and meets the technical requirements ↗ *Chapter 3.1.4 "Gas Supply Data" on page 46.*

A supply of span gas can be connected to the sample-in-line independently from sample gas.

Span gas should have a concentration of 80 % to 110 % of the upper measuring range limit to the gas path. Using lower concentrations may decrease accuracy when measuring above the span gas concentration!

#### USB storage device

The USB-Storage Device is used for external data backups and must meet the specifications of USB 1.0 or higher. The device plug must be a USB male connector (type A).

It is recommended to use storage devices manufactured by renowned brands such as SANDISK, KINGSTON, TOSHIBA etc..

Always test functionality of USB-Storage Device before using it for (important) backups.

### Zero gas supply (N<sub>2</sub>)

The zero gas supply is N<sub>2</sub> of high purity.

The nitrogen should, as a minimum, be of quality of 5.0, which means nitrogen of purity  $\geq$  99.999 %. If such gas is not available, the substitute must be dry, clean and free of corrosives or components containing solvents. It has to be free of components to be measured, to minimize cross interferences.

The supply of zero gas (N<sub>2</sub>) can be connected to the sample gas connector independently from sample gas or air supply.

The zero gas supply must also meet the technical requirements [Chapter 3.1.4 "Gas Supply Data" on page 46](#).

## 2.2 Inputs and Outputs

### 2.2.1 Inputs and Outputs: General Information

#### Limits and SELV

All external inputs shall provide reinforced or double insulation for protection against electric shock and with output voltages below the limits of 6.3.1 of 61010-1 or 30 V RMS and 42.4 V peak or 60 V DC.

Connect only secondary circuits that are designed in a way that under normal and single fault conditions, the voltage between any two parts of the SELV circuit does not exceed safe values.

### 2.2.2 Inputs and Outputs: Data Connectors

## 2.2.2.1 Overview of Backpanel Configurations

### Available Configurations

The Following configurations are available for the Analyzer:

Option no.	Optional I/Os	Screw Terminal Extension	Description
1	-	-	☞ "Data Connectors - Without Optional I/Os - Without Screw Terminal Extensions" on page 21
2	Digital I/Os	-	☞ "Data Connectors - With Optional Digital I/Os - Without Screw Terminal Extensions" on page 22
3	Analog Input	-	☞ "Data Connectors - With Optional Analog Inputs - Without Screw Terminal Extensions" on page 22
4	Digital I/Os	yes	☞ "Data Connectors - With Optional Digital I/Os - With Screw Terminal Extensions" on page 23
5	Analog Input	yes	☞ "Data Connectors - With Analog Input - With Screw Terminal Extensions" on page 23

### Data Connectors - Without Optional I/Os - Without Screw Terminal Extensions

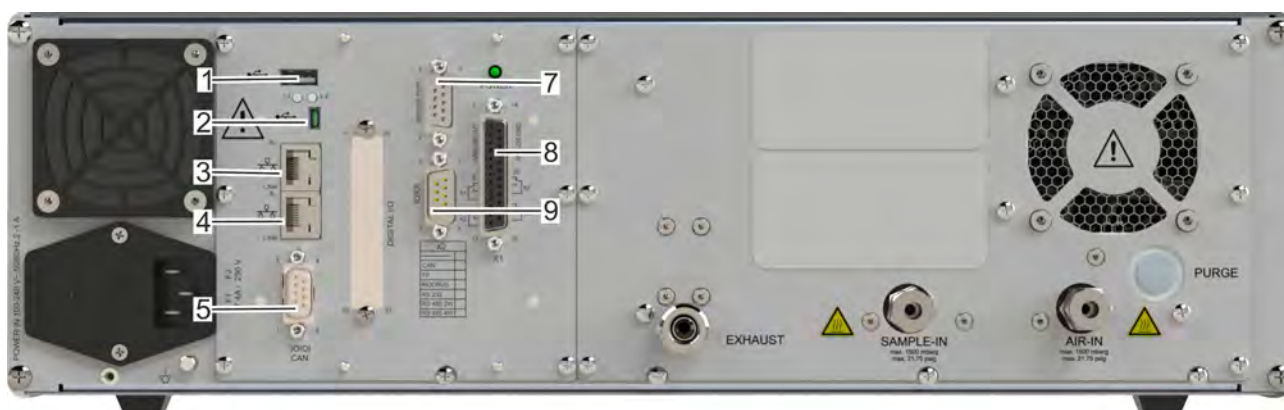


Fig. 6: Option 1

- |                                             |                                           |
|---------------------------------------------|-------------------------------------------|
| 1 USB-port 1 (USB-A)                        | 5 CAN interface (reserved for future use) |
| 2 USB-port 2 (mini-USB)                     | 7 Service port                            |
| 3 RJ45 Ethernet connector (2)               | 8 Analog outputs / relay outputs          |
| 4 RJ45 Ethernet connector (1, process port) | 9 Serial interface (RS 232 / Modbus 485)  |

## Data Connectors - With Optional Digital I/Os - Without Screw Terminal Extensions

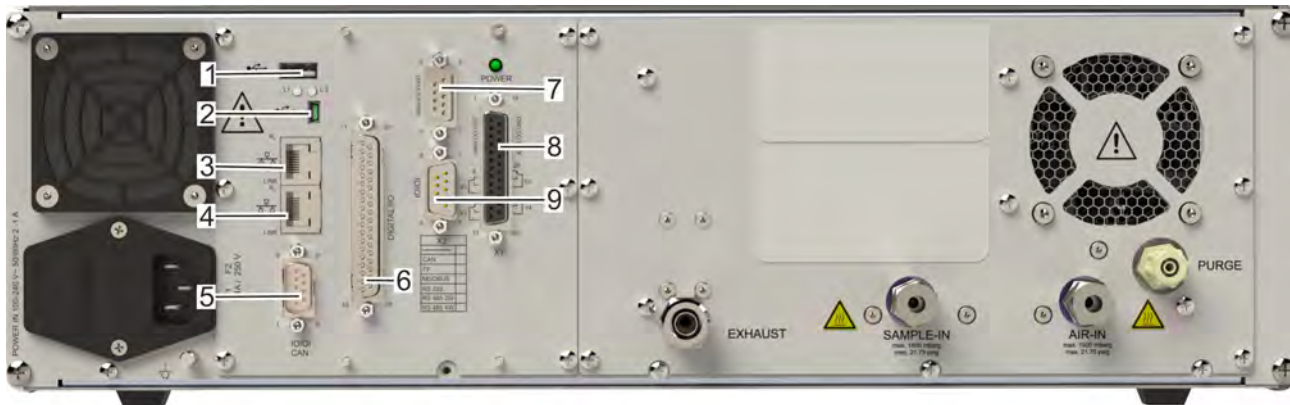


Fig. 7: Option 2

- |   |                                           |   |                                        |
|---|-------------------------------------------|---|----------------------------------------|
| 1 | USB-port 1 (USB-A)                        | 6 | Digital in- / outputs                  |
| 2 | USB-port 2 (mini-USB)                     | 7 | Service port                           |
| 3 | RJ45 Ethernet connector (2)               | 8 | Analog outputs / relay outputs         |
| 4 | RJ45 Ethernet connector (1, process port) | 9 | Serial interface (RS 232 / Modbus 485) |
| 5 | CAN interface (reserved for future use)   |   |                                        |

## Data Connectors - With Optional Analog Inputs - Without Screw Terminal Extensions

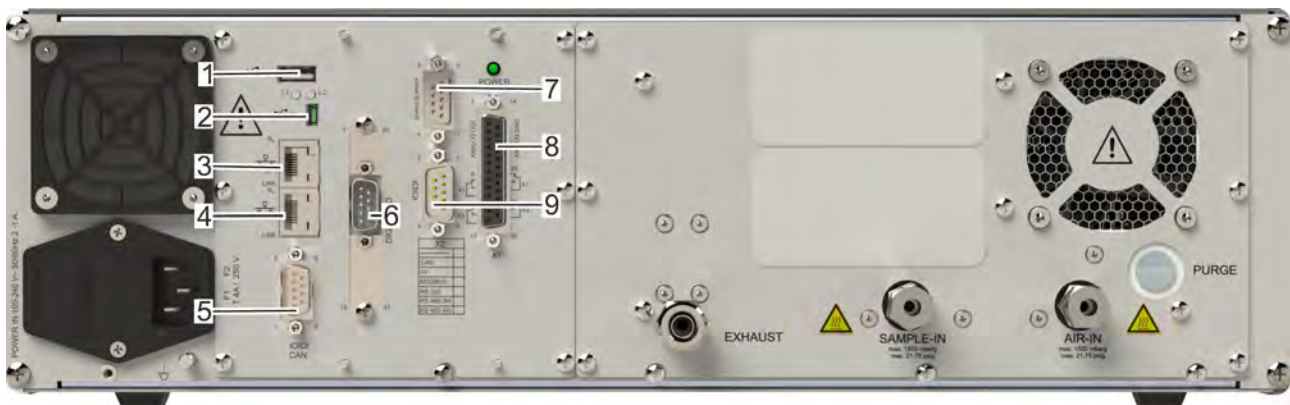


Fig. 8: Option 3

- |   |                                           |   |                                        |
|---|-------------------------------------------|---|----------------------------------------|
| 1 | USB-port 1 (USB-A)                        | 6 | 9-pin Analog input                     |
| 2 | USB-port 2 (mini-USB)                     | 7 | Service port                           |
| 3 | RJ45 Ethernet connector (2)               | 8 | Analog outputs / relay outputs         |
| 4 | RJ45 Ethernet connector (1, process port) | 9 | Serial interface (RS 232 / Modbus 485) |
| 5 | CAN interface (reserved for future use)   |   |                                        |



## Data Connectors - With Optional Digital I/Os - With Screw Terminal Extensions

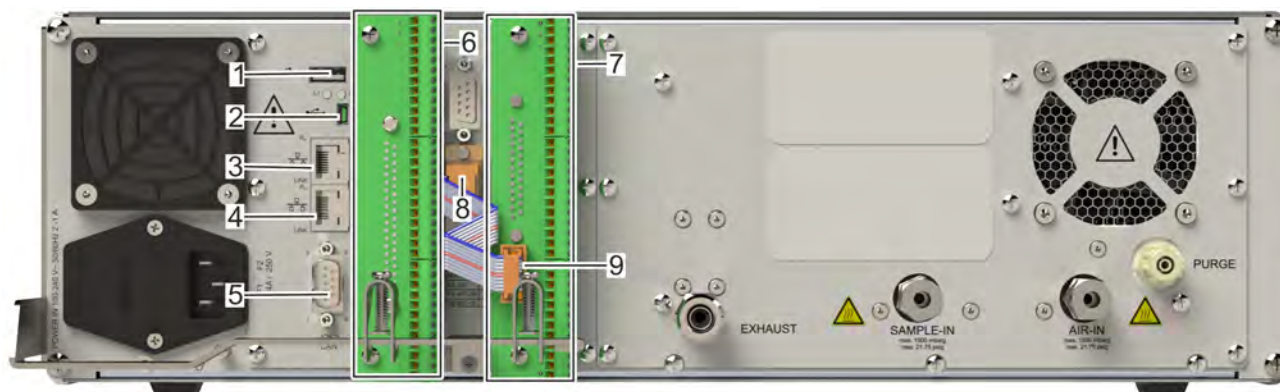


Fig. 9: Option 4

- |   |                                           |   |                               |
|---|-------------------------------------------|---|-------------------------------|
| 1 | USB-port 1 (USB-A)                        | 6 | Screw terminal extension XSTD |
| 2 | USB-port 2 (mini-USB)                     | 7 | Screw terminal extension XSTA |
| 3 | RJ45 Ethernet connector (2)               | 8 | Ribbon cable connector (XPSA) |
| 4 | RJ45 Ethernet connector (1, process port) | 9 | Ribbon cable connector (XSTA) |
| 5 | CAN interface (reserved for future use)   |   |                               |

## Data Connectors - With Analog Input - With Screw Terminal Extensions

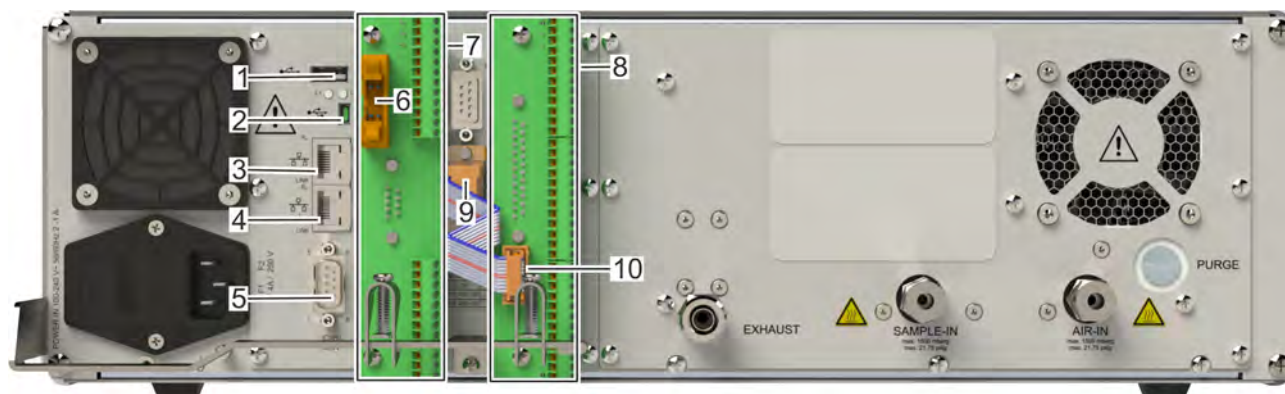


Fig. 10: Option 5

- |   |                                           |    |                                 |
|---|-------------------------------------------|----|---------------------------------|
| 1 | USB-port 1 (USB-A)                        | 6  | Ribbon cable connector (XSTI)   |
| 2 | USB-port 2 (mini-USB)                     | 7  | Screw terminal extension XSTI   |
| 3 | RJ45 Ethernet connector (2)               | 8  | Screw terminal extension (XSTA) |
| 4 | RJ45 Ethernet connector (1, process port) | 9  | Ribbon cable connector (XPSA)   |
| 5 | CAN interface (reserved for future use)   | 10 | Ribbon cable connector (XSTA)   |

### 2.2.2.2 Description of Data Connectors

#### USB connectors

(Fig. 6/1 + 2)

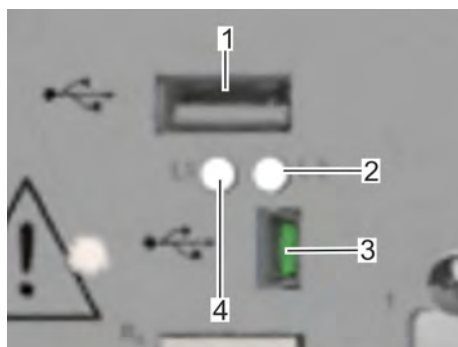


Fig. 11: USB-ports

The device is equipped with two USB-connectors. Only one connector can be used at any one time. The active USB-connector is selected via software settings.

External data storage devices can be connected to the USB-A connector (Fig. 11/1). The mini-USB port (Fig. 11/3) is designed to connect measurement devices (computers).



Overview of LED-states: ↗ "Status LED" on page 38

## RJ45 Ethernet Connectors

(Fig. 6/3 + 4)

The Ethernet (Modbus) interface offers the same form of communication with a data acquisition system as a serial interface. Furthermore, this interface enables to connect the analyzer to a network, providing webbrowser access. This interface is electrically isolated from the unit's electronic components and enables the construction of a network of several analyzers.

Ethernet1 can be used to connect the analyzer to a network.

Ethernet2 can be used to connect a PC directly via crossover cable.

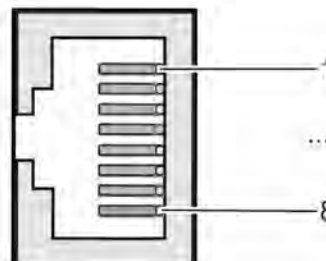


Fig. 12: RJ45 connector

#	Signal
1	TX +
2	TX -
3	RX +
4	not used
5	not used
6	RX -
7	not used
8	not used



## Option: Analog inputs

(Fig. 8/6)



*Instead of having analog inputs the analyzer is optionally available with digital in/outputs.*

Optionally, the Analyzer can be equipped with a 9-pin analog input. The pinout is as follows:

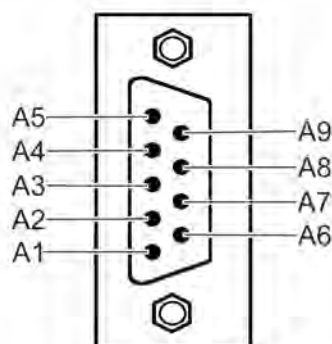


Fig. 13: Passive Analog Interface (X5-connector, option 2)

#	Signals	Note
A1	BR1	fit a wire bridge here to apply analog signal in current mode to input 1*
A2	BR1	
A3	<i>not used</i>	-
A4	BR2	fit a wire bridge here to apply analog signal in current mode to input 2**
A5	BR2	
A6	Input 1 high (+)	-
A7	Input 1 low (-)	-
A8	Input 2 low (-)	-
A9	Input 2 high (+)	-

\*alternatively set jumper P2 on electronics board XAS1.

\*\*alternatively set jumper P1 on electronics board XAS1.

Electrical specifications of two analog inputs:

- 0–1 (10) V, software selectable;  $R_{in} = 100 \text{ k}\Omega$
- Optional (requires to fit wire bridges, see figures): 0–20 mA ;  $R_{in} = 50 \text{ }\Omega$
- Protected against overload up to  $\pm 15 \text{ V}$  or  $\pm 20 \text{ mA}$

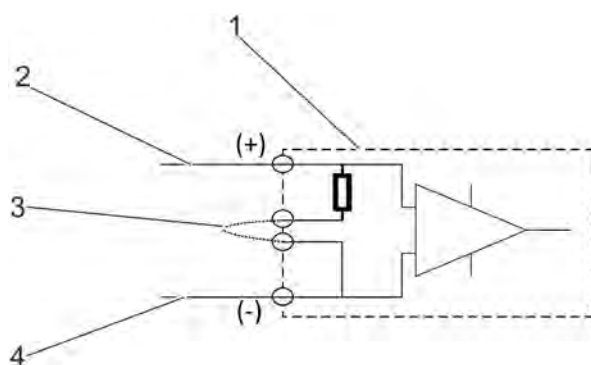


Fig. 14: Passive Analog Input

- 1 Passive Analyzer input
- 2 Input signal, high
- 3 Wire bridge (optional)
- 4 Input signal, low



The optional wire bridge is used for current mode selection.

If the Analyzer is equipped with analog inputs, a terminal extension is available ☞ “XSTI adapter” on page 34.

## Option: Digital In/Outputs

(Fig. 7/6)



Instead of having digital in/outputs the analyzer is optionally available with an analog inputs.

Optionally, the Analyzer can be equipped with a 37-pin digital in/output interface. The pinout is as follows:

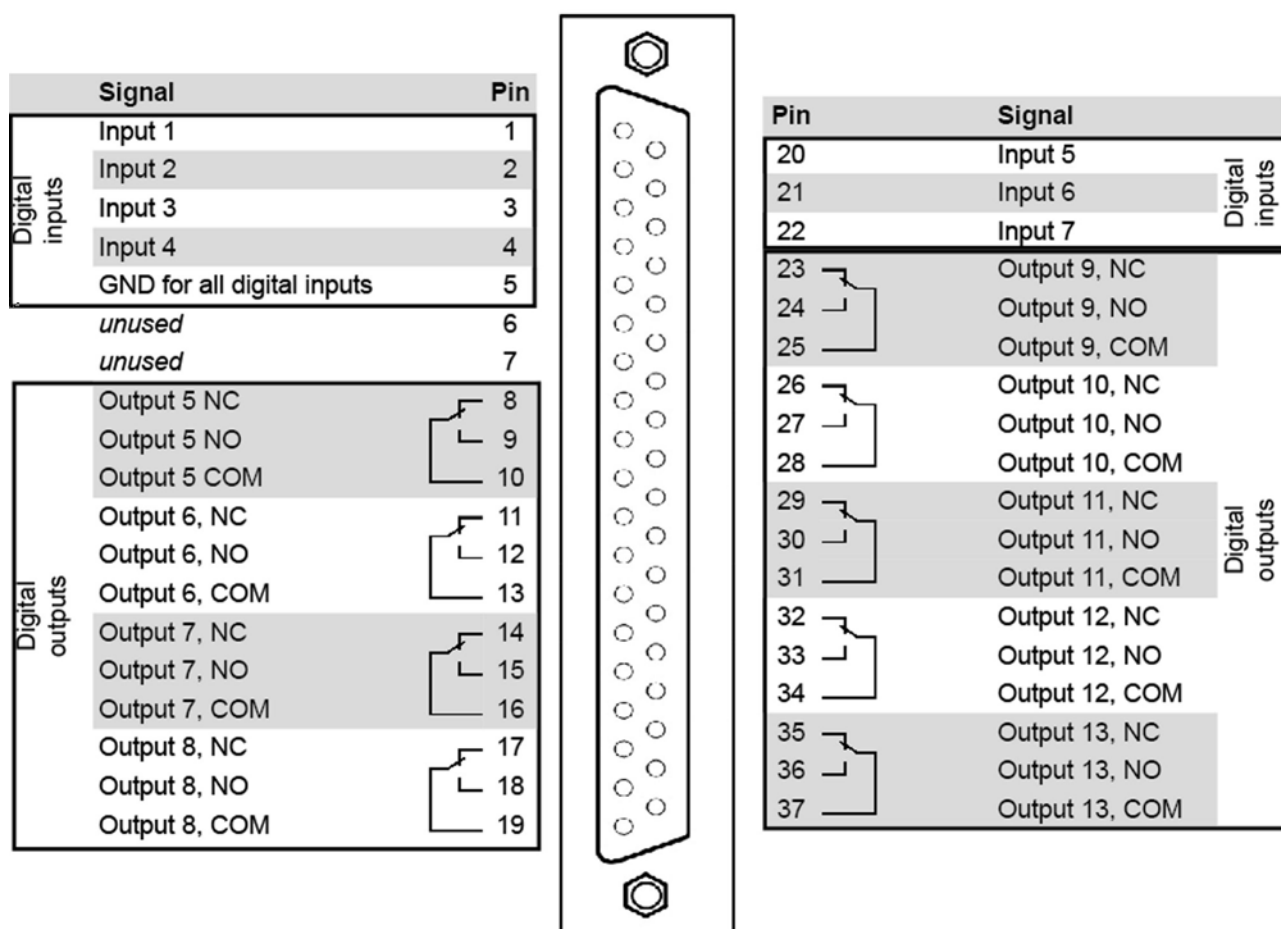


Fig. 15: Digital in- / outputs (optional)

If the Analyzer is equipped with a digital in/output, a terminal extension is available ☞ “XSTD adapter” on page 34.

## Service Port

(Fig. 6/7)

The Service port connector is configured as an RS 232 connector with pinout as shown here:

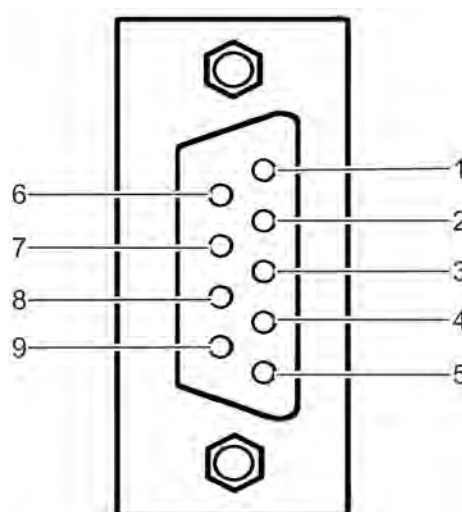


Fig. 16: Service port

#	Signals
1	Common
2	RSD
3	TXD
4	not used
5	Common

#	Signals
6	not used
7	not used
8	not used
9	not used

## Analog Outputs / Relay Output (X1)

(Fig. 6/8)

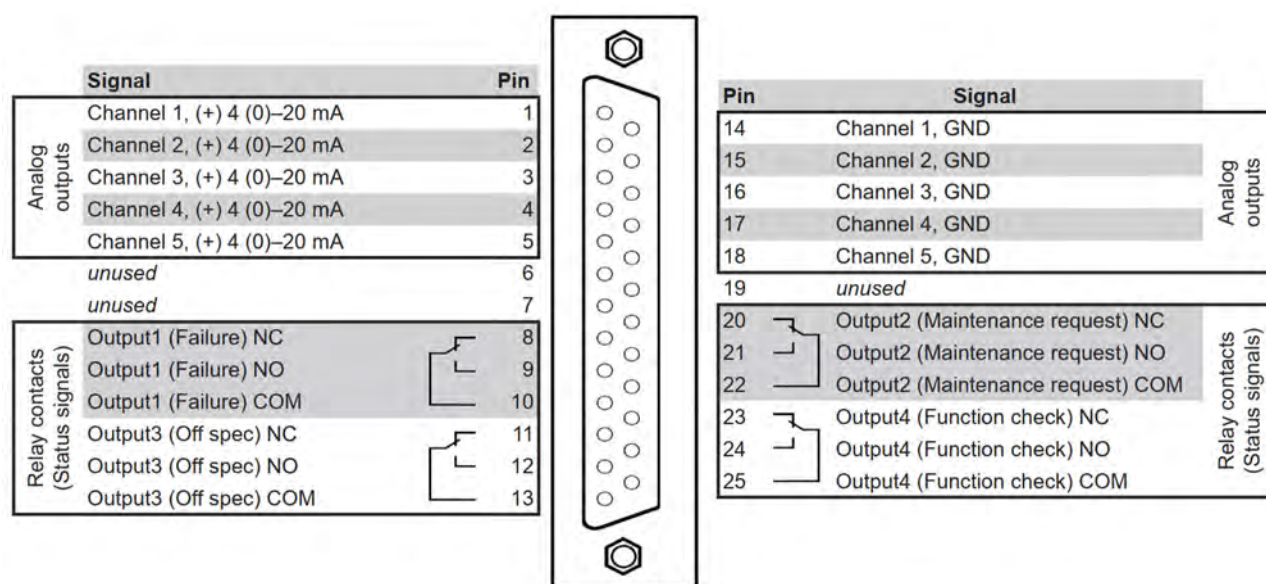


Fig. 17: Analog Outputs / Relay outputs

The X1-Interface is by default configured as shown in Fig. 17.

Five software-configurable analog outputs can be used to supply external devices with analog signals.

The 4 relay-outputs are by default assigned according to NAMUR-specification NE 107 (status signals).

The technical data of analog outputs and relay outputs is as follows:

Data	Value	Unit
Current, analog output	4 (0)–20	mA
Burden ( $R_B$ ), analog output	< 500	$\Omega$
Current, relay output	1	A
Voltage, relay output	30	VDC
Load, relay output	30	W

By default, the Analyzer is fitted with one output, which can transmit data on concentration levels to an external data acquisition system. Up to five analog outputs can be installed.

The analog outputs support several operation modes, such as 4-20 mA, 0-20 mA, as well as the NAMUR NE 43 specifications (incl. Live Zero). Operation modes can be set in a software menu (6-76).

The factory setting for analog outputs is 4-20 mA.

X-STREAM analyzers support up to five analog outputs that do not always have to be assigned to measurement channels which are physically present.

If a unit features less than five channels, the remaining analog outputs can be used to transmit concentration levels with a different resolution. For example, the XECLD could be set up as follows:

Output 1: 0 ... 10 ppm NO = 4 ... 20 mA

Output 2: 0 ... 100 ppm NO = 4 ... 20 mA

## Serial Interface (X2)

(Fig. 6/9)

A serial interface with the Modbus protocol allows communication with external data acquisition systems. The interface enables the exchange and modification of measurement and analyzer signals, analyzer status monitoring as well as remote activation of procedures.

The serial Interface (X2) may have different signal configurations:

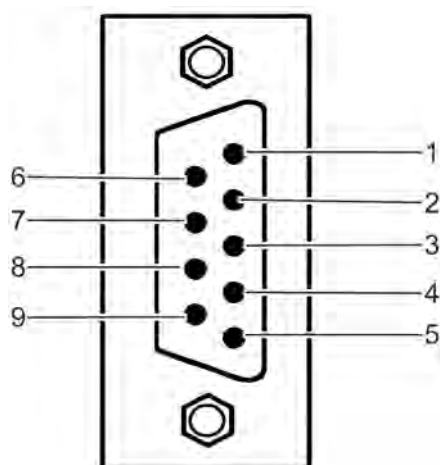


Fig. 18: Serial interface

#	Signals		
	MOD 485/2 wire	MOD 485/4 wire	RS232
1	Common	Common	Common
2	not used	not used	RSD
3	not used	not used	TXD
4	not used	RXD1 (+)	not used
5	D1 (+)	TXD1 (+)	Common
6	not used	not used	not used
7	not used	not used	not used
8	not used	RXD1 (-)	not used
9	D0 (-)	TXD1 (-)	not used

The active configuration is indicated by a marking on a table below the Serial interface:

X2	
CAN	
FF	
MODBUS	
RS 232	X
RS 485 2W	
RS 485 4W	

Fig. 19: Configuration table

In the example shown, the X2 connector is configured as an RS 232 interface (Fig. 19).

## 2.2.2.3 Screw Terminal Extensions (Optional)

### Terminal Extensions

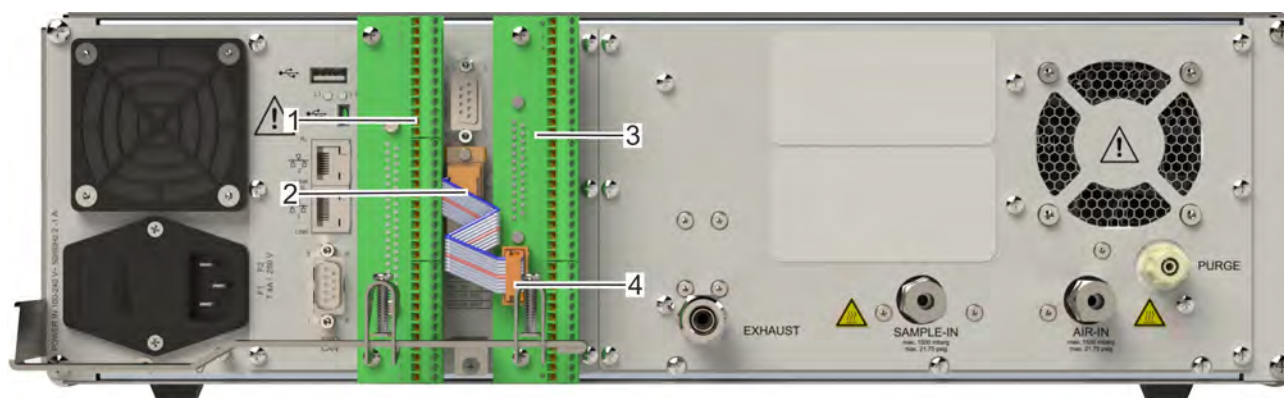


Fig. 20: Screw terminal extensions

Screw terminals are available optionally and allow the user to establish individual configurations.

Screw terminal extensions are available for the optional 37-pin connector (Fig. 20/1, alternatively for a 9-pin analog input and for the 25-pin analog / relay output (Fig. 20/3). Via flat cable the serial interface X2 (Fig. 20/2) can also be connected to the lower part of the right screw terminal extension (Fig. 20/4).



## Equipotential Bonding



Fig. 21: Cable leads

The shield of cables connected to terminal extensions must be routed through the shield connection (Fig. 21/2) to establish equipotential bonding. Screw terminals (Fig. 21/1) are described in the following sections.

### Connection Data

All screw terminal extensions share the following technical properties:

Property	Value
Wire gauge, recommended	AWG 26 – AWG 16 (0.14 – 1.5 mm <sup>2</sup> )

Property	Value
Stripping length	0.2" (5 mm)
Thread	M2
Tightening torque, min	2.21 in lb (0.25 Nm)



## XSTA adapter

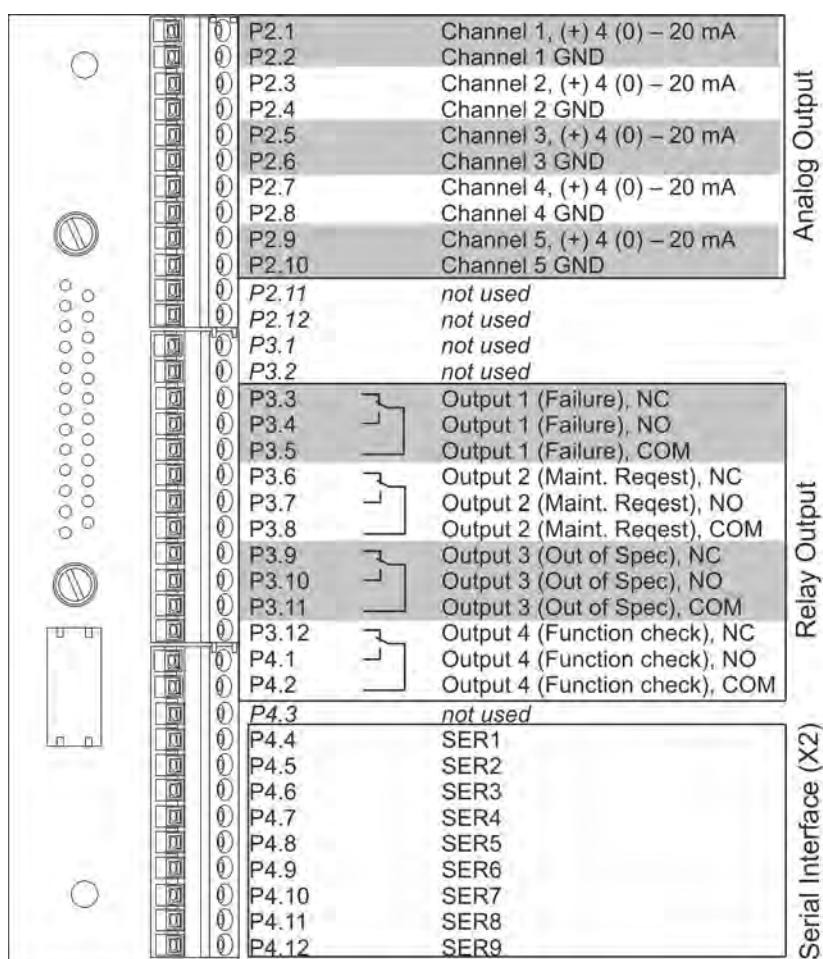


Fig. 22: XSTA adapter (Terminal extension)

The Terminal extension for the XSTA adapter allows to individually wire analog outputs and relay outputs (X1 connector). It also offers a possibility to connect the X2 connector via flat cable.

The **Analog Outputs** (Fig. 22/P2.1 – 2.10) can be individually configured via software settings.

The configuration of **Relay Outputs** (Fig. 22/P3.3 – P4.2) is set per factory setting and represents standard NAMUR status signals. The signals set may also be adapted via software settings.

The **Serial Interface** (Fig. 22/P4.4 – P4.12) may be set to different modes of operation. For a description of the possible configurations see [Serial Interface \(X2\) on page 28](#).

In default configuration, the connectors 2.11 – P3.2 and P4.3 are not used.



When wiring individually, make sure the cable shielding is properly connected to the equipotential bonding [“Equipotential Bonding” on page 32](#).

## XSTD adapter

An XSTD adapter can optionally be used to connect digital I/O cables to screw-type terminals instead of Submin-D plugs and sockets; it is plugged into the digital I/O Submin-D connectors on the unit.

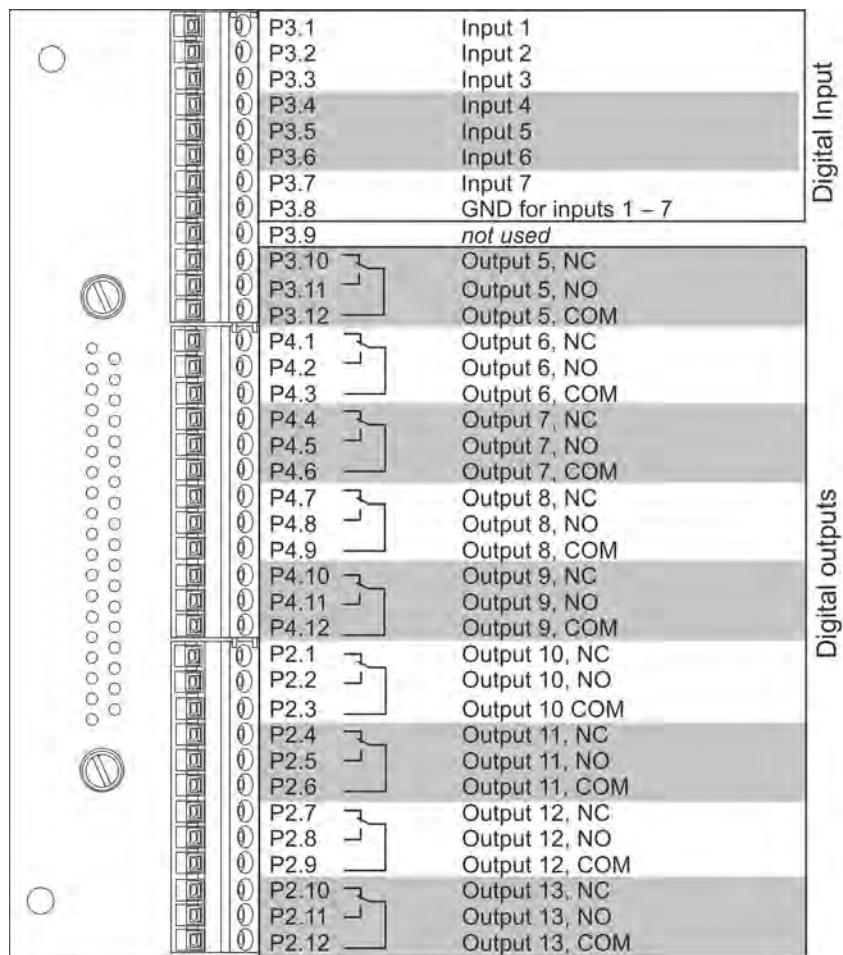


Fig. 23: XSTD adapter (Terminal extension)

## XSTI adapter

An XSTI adapter can optionally be used to connect analog input cables to screw-type terminals instead of Submin-D plugs and sockets; it is plugged into the optional analog input connector on the unit.

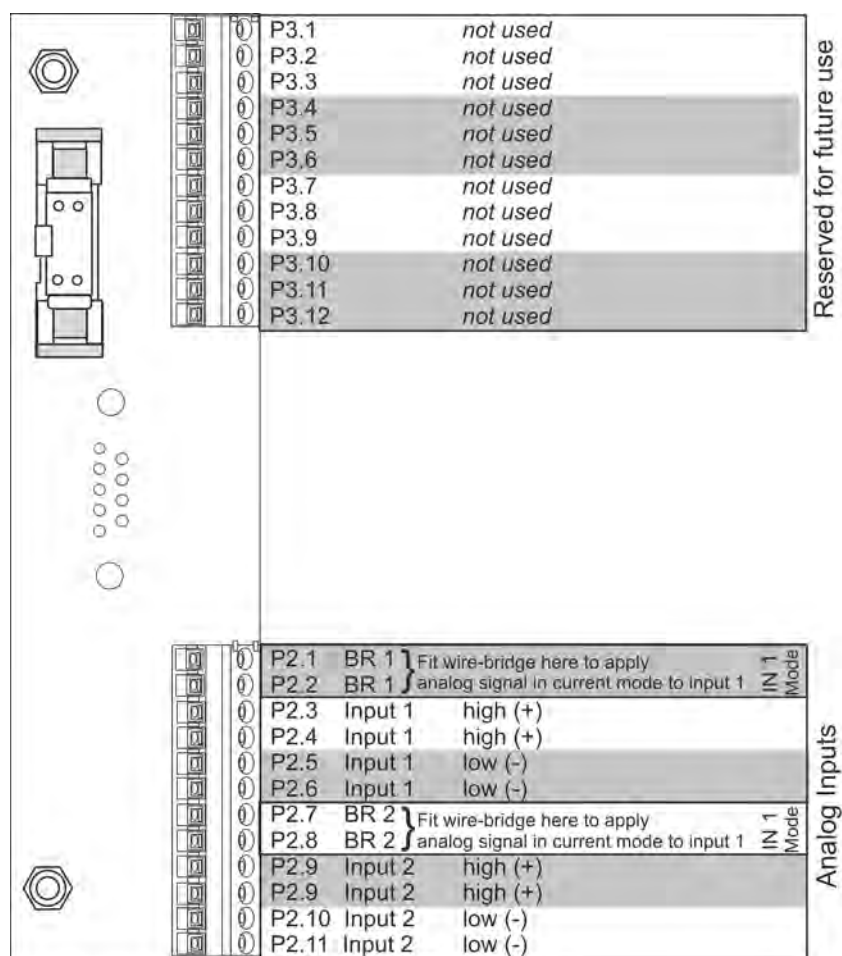


Fig. 24: XSTI adapter (Terminal extension)

## 2.2.3 Inputs and Outputs: Gas Connectors

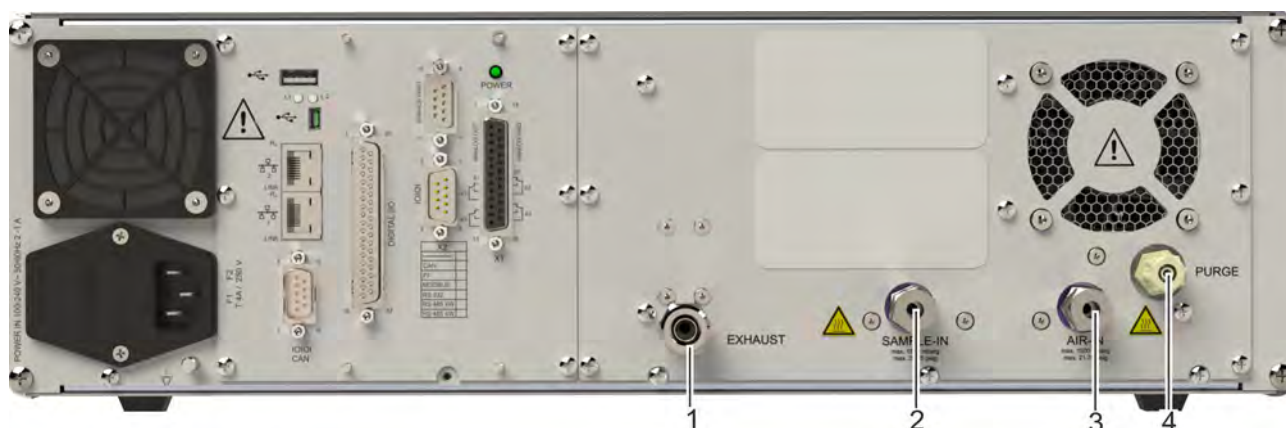


Fig. 25: Gas connections

- |             |                    |
|-------------|--------------------|
| 1 EXHAUST   | 3 AIR IN           |
| 2 SAMPLE IN | 4 PURGE (optional) |

Three gas connectors and an optional fourth are located on the back panel of the Analyzer (Fig. 25/1 – 4). The PURGE gas connector is only available for direct connection of PTFE (e. g. Teflon®) or FKM (e. g. Viton®) tubings. EXHAUST, SAMPLE IN and AIR IN connectors can be ordered in two different versions:

- 6 or 10 mm fitting
- 1/4" or 3/8" fitting

Sample gas must be supplied at the SAMPLE IN connector (Fig. 25/2). Pressurized Air as specified within this manual (☞ Chapter 2.2.3 "Inputs and Outputs: Gas Connectors" on page 35) that can be used to supply the Ozonator is connected to the AIR IN connector (Fig. 25/3). The exhaust's gas line must be connected to the EXHAUST connector (Fig. 25/1). Optionally, a PURGE connector (Fig. 25/4) which may be used as a purge gas inlet can be installed.



Technical specifications on connected gases and systems: ☞ Chapter 3.1.4 "Gas Supply Data" on page 46

## 2.2.4 Electrical connectors

### Power Connector

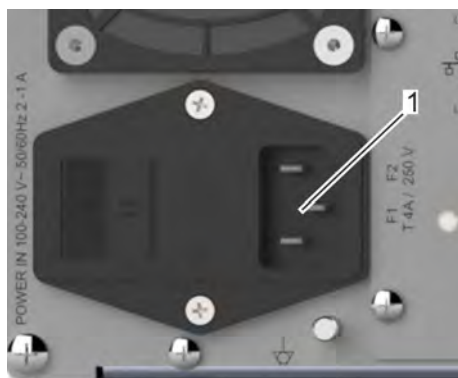


Fig. 26: Power connector

The Power connector (Fig. 26/1) is located at the lower left of the backpanel.

**Only connect the supplied IEC C13 connector cable!**

### Equipotential Bonding Connector

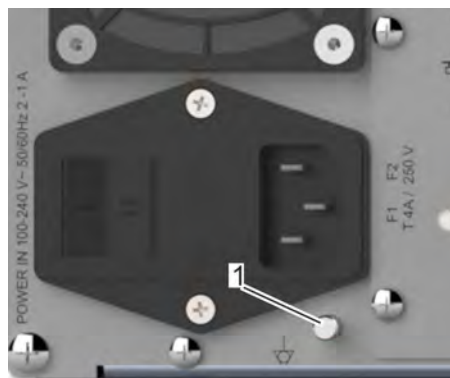


Fig. 27: Equipotential Bonding Connector

The equipotential bonding connector (Fig. 27/1) is located at the lower left of the backpanel, directly below the power connector. Use the equipotential bonding connector for grounding the Analyzer.

## 2.3 Controls, Signals and Display

### ON/OFF switch



Fig. 28: ON/OFF switch

The ON/OFF switch (Fig. 28/1) is located on the left side of the rear panel, adjacent to the IEC connector.

The ON/OFF switch connects or disconnects the power supply to the Analyzer.

## Status LED

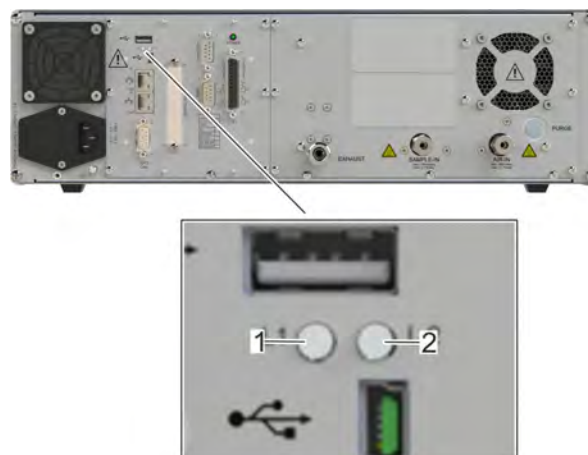


Fig. 29: Status LEDs

- 1 LED 1
- 2 LED 2

The Status LEDs are located on the left side of the backpanel, next to the air inlet of case ventilation and above the RJ45 connectors. The Status LEDs indicate the Analyzer's status considering software and operational readiness. LED 1 (Fig. 29/1) is labeled "L1" and LED 2 (Fig. 29/2) "L2".

LED state	Meaning	Recommended action
LED 1: Blinking (green) LED 2: constantly ON (green)	Regular state of operation.	
LED 1: Blinking (red)	NAMUR "Failure" state.	Check displayed failure description and consult troubleshooting in the appendix <a href="#">Appendix "Troubleshooting"</a> on page 241.
LED 1: constantly ON (green) LED 2: constantly ON (green)	Analyzer not properly programmed.	Inform customer services. Let authorized service personnel program analyzer.
LED 1 and LED 2 : blinking alternately (green)	New program version has just been loaded. User input is expected.	Mind displayed messages or let authorized service personell login via TELNET.



## POWER LED

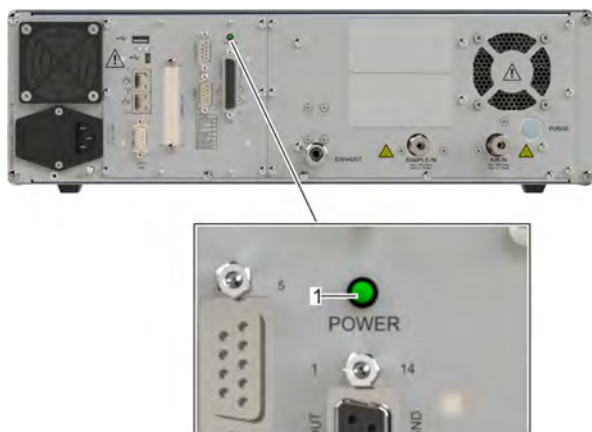


Fig. 30: Power LED

### 1 POWER LED

The POWER LED (Fig. 30/1) is located in the upper part of the back panel above the X1-Interface. When the Analyzer is connected to the power grid and the ON/OFF switch is switched to position [I] the POWER LED is lit.



### WARNING!

Only open housing, when POWER LED is not lit!

## Softkeys

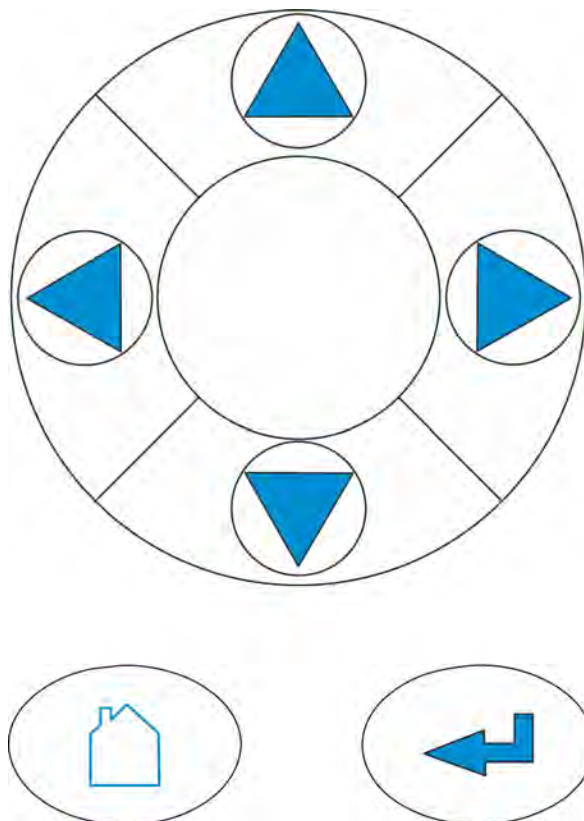







Fig. 31: Softkeys

The softkeys are located in the center of the front panel. The main function of the soft keys is navigating through the software menu.

Via softkeys the software menu can be accessed, tasks can be executed and status messages can be displayed.

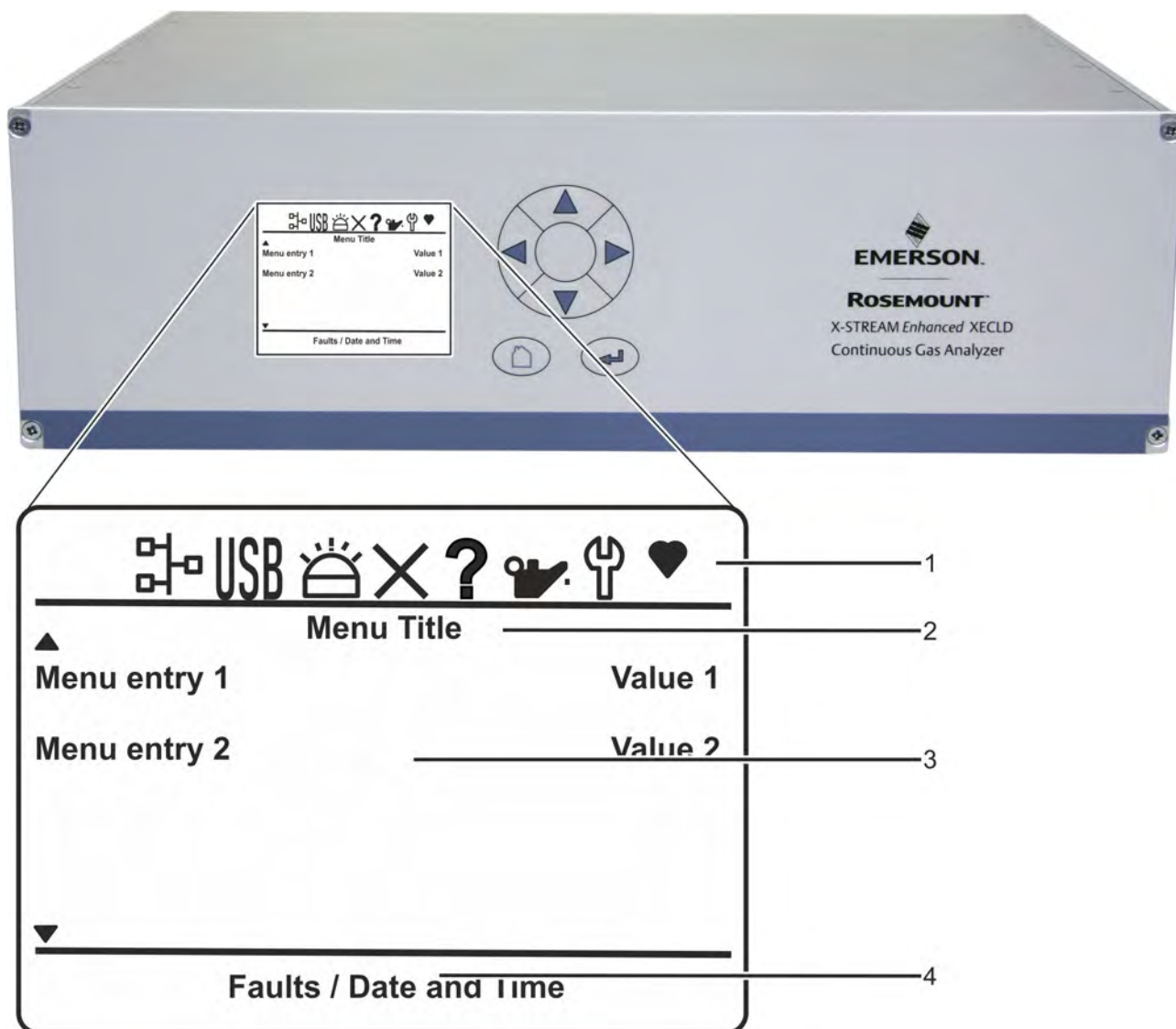
Softkey		Function (s)
	UP Key	■ Navigate up within a menu
	DOWN Key	■ Navigate down within a menu
	RIGHT Key	■ Enter the highlighted sub menu

Softkey		Function (s)
	LEFT Key	<ul style="list-style-type: none"> <li>Return from a sub-menu to the higher level menu.</li> </ul>

Softkey		Function (s)
	HOME Key	<ul style="list-style-type: none"> <li>Return to home screen</li> </ul>
	ENTER Key	<ul style="list-style-type: none"> <li>Execute a function</li> <li>Enter a value</li> </ul>



## Display



*Fig. 32: Display*

The display is located at the center of the front panel (Fig. 32).

The contents displayed are divided in four sections:

In the status symbol section (Fig. 32/1) a selection of symbols describes the states of operation. The menu title line (Fig. 32/2) indicates the current active menu and – if applicable – the number of the sub-menu pages. In the Menu sections, menu entries (Fig. 32/3) and their associated values or settings are shown. On the bottom of the display, the status message line (Fig. 32/4) displays date and time or any pending error messages.

Refer to [Chapter 5.3 “Software”](#) on page 59 for a detailed description.

## 3 Technical Data

### Units Rounded



*The values in imperial units given in the following are calculated from metric units. The calculated values are rounded. This can produce small deviations from the actual values.*

## 3.1 Housing Data, Connection Data, Environmental Conditions and Emissions

### 3.1.1 Housing Data

#### Dimensions (without screw extensions)

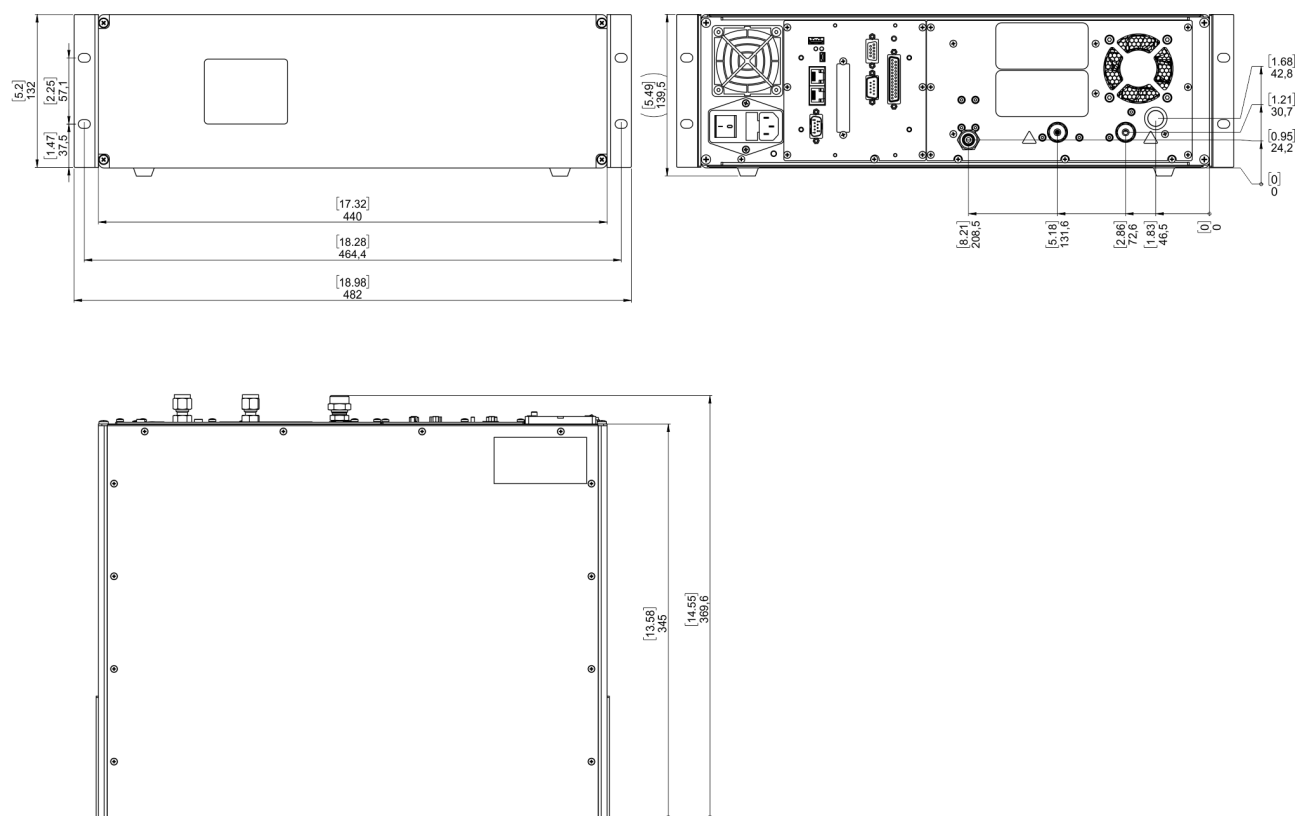


Fig. 33: Dimensions

Data	Value	Unit
Dimension* (length)	369.6 (14.55)	mm (in)
Dimension* (width)	440 (17.32)	mm (in)
Dimension* (height)	132 (5.2)	mm (in)
Weight	12.3 (27.12)	kg (lb)
Mounting, Type A	19" rack mount	-
Mounting, Type B	Table top	-
Ingress protection rating	IP20	-
Safety clearance**	1	RU
Air flow, housing fan	0.88 (1.15)	m³/min (yd³/min)

\*Dimensions without housing feet or rack mounting brackets.

\*\*Make sure there is at least one unoccupied Rack Unit (RU) above and underneath the designated mounting location.

## Dimensions (with screw extensions)

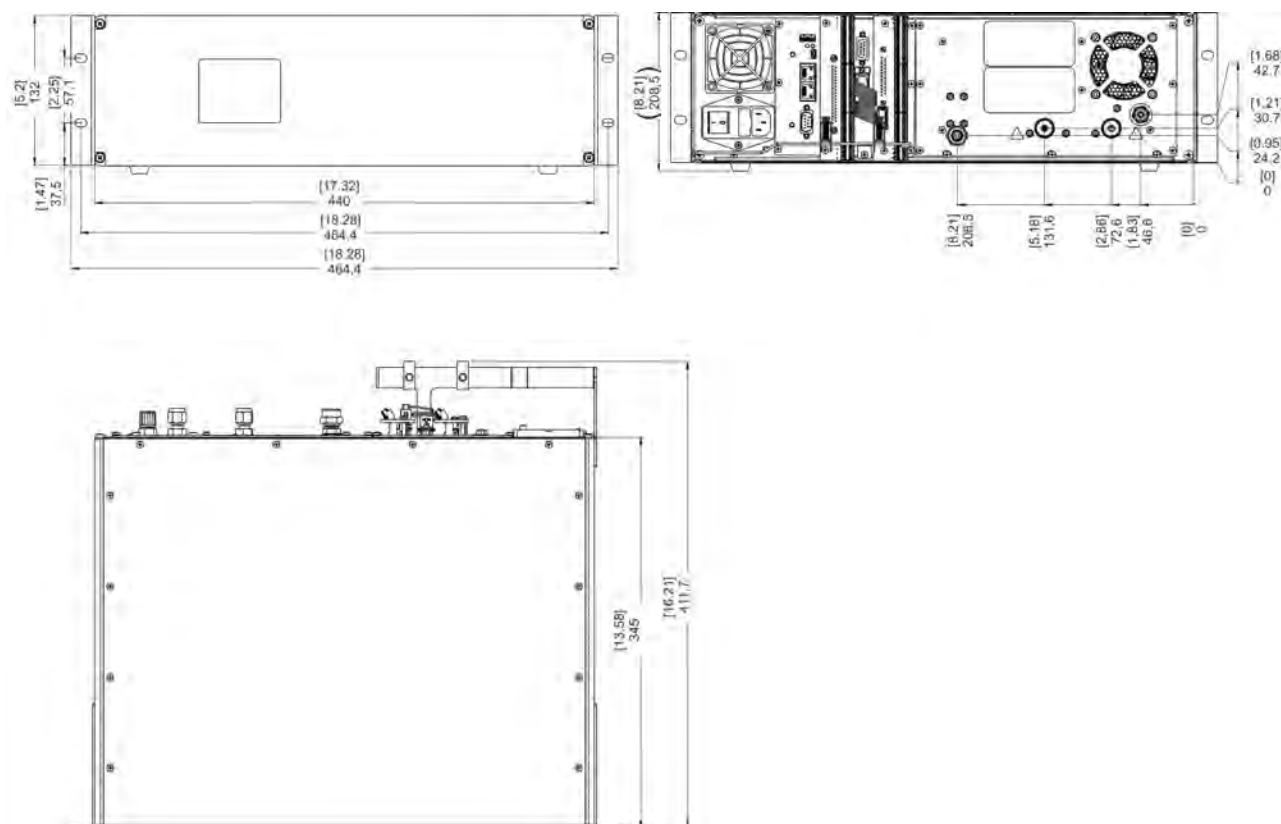


Fig. 34: Dimensions

Data	Value	Unit
Dimension* (length)	411,7 (16.21)	mm (in)
Dimension* (width)	440 (17.32)	mm (in)
Dimension* (height)	132 (5.2)	mm (in)
Weight	12.3 (27.12)	kg (lb)
Mounting, Type A	19" rack mount	-
Mounting, Type B	Table top	-
Ingress protection rating	IP20	-
Safety clearance**	1	RU
Air flow, housing fan	0.88 (1.15)	m <sup>3</sup> /min (yd <sup>3</sup> /min)

\*Dimensions without housing feet or rack mounting brackets attached.

\*\*Make sure there is at least one unoccupied Rack Unit (RU) above and underneath the designated mounting location.

### 3.1.2 Performance Specifications

Detection limit ( $4\sigma$ ) <sup>1, 2</sup>	$\leq 1.0 \%$	
Linearity <sup>1, 2</sup>	$\leq 1.0 \%$	
Repeatability <sup>1, 2</sup>	$\leq 0.5 \%$	
Response time ( $t_{90}$ ) <sup>3</sup>	$\leq 2 \text{ s for range } > 25 \text{ ppm}^4$	$\leq 4 \text{ s for range } \leq 25 \text{ ppm}^5$
Zero-point drift <sup>1, 2</sup>	$\leq 0.5 \%$ per 24 h	
Span (sensitivity) drift <sup>1, 2</sup>	$\leq 1.0 \%$ per 24 h	
Permissible ambient temperature	$+5 - +40 \text{ }^\circ\text{C}$ ( $+41 - +104 \text{ }^\circ\text{F}$ )	
Zero-point temperature effect <sup>1, 6</sup>	$\leq 2.0 \%$ per 10 K	
Span (sensitivity) temp. effect <sup>1, 6</sup>	$\leq 3.0 \%$ per 10 K	
Maximum gas pressure	$\leq 1500 \text{ hPa gauge}$ ( $\leq 21 \text{ psig}$ )	
Warm-up time <sup>7</sup>	30 – 60 minutes	

<sup>1</sup>Related to full scale.

<sup>2</sup>Constant pressure and temperature.

<sup>3</sup>From gas analyzer inlet.

<sup>4</sup>Electronic damping = 0s.

<sup>5</sup>Electronic damping = 3s.

<sup>6</sup>Temperature variation:  $\leq 10\text{K}$  per hour.

<sup>7</sup>Depending on ambient temperature.

### 3.1.3 Power Connection Data

Data	Value	Unit
Mains overvoltage category, transient	II	-
Mains connection	IEC Connector (C13)	-
Mains voltage	100...240	V AC
Net frequency	50 / 60	Hz
Mains cartridge fuse*	5 x 20 (0.2 x 0.79)	mm (in)
Power consumption	approx. 120	W
Nominal input current, max.	2...1	A
Mains supply voltage fluctuations	$\pm 10$	%
Mains Fuse, trip current	4	A
Mains Fuse, nominal voltage	250	V
Mains Fuse, breaking capacity	1500 A @ 250 V AC	-

\*Fuses are available from Emerson. Only use fuses listed in the spare parts list ↗ “Fuses” on page 227.

### 3.1.4 Gas Supply Data

#### Chemical components

#### **! NOTICE!**

Never apply highly corrosive gases (e. g. Chlorine or H<sub>2</sub>S) in concentrations of approximately 1 % or higher!



**Technical Data**

Only use conditioned gases ➤ Chapter 7.6 “Gas Conditioning” on page 165.

Data	Value	Unit
Sample gas connection, type A	6	mm
Sample gas connection, type B	1/4	in
Air supply connection (ozonator), type A	6	mm
Air supply connection (ozonator), type B	1/4	in
Exhaust outlet, type A	10	mm
Exhaust outlet, type B	3/8	in
Sample gas, pressure	0.6 – 1.5 (8.7 – 21.8)	barg (psig)
Sample gas, flow	500 – 1000 (1831 – 3661)	ml/min (in <sup>3</sup> /h)
Sample gas, dew point*	0 (23)*	°C (°F)
Sample gas, max. temperature	45 (113)	°C (°F)
Sample gas, max. particulate size	< 2	µm (micron)
Air supply (ozonator), pressure	0.6 – 1.5 (8.7 – 21.8)	barg (psig)
Air supply (ozonator), flow	400 – 1000 (1464 – 3661)	ml/min (in <sup>3</sup> /h)
Air supply (ozonator), dew point	< -5 (23)*	°C (°F)
Air supply (ozonator), max. temperature	45 (113)	°C (°F)
Air supply (ozonator), particulate size	< 2	µm (micron)
Ozone emission, max.**	3300	ppm
Exhaust emission***	approx. 2000 (7323)	ml/min (in <sup>3</sup> /h)

\*Dew points of sample gas must be at least 5 °C (9 °F) below ambient temperature.

\*\*At 300 (1098) ml/min (in<sup>3</sup>/h) (max. measured laboratory value).

\*\*\*Contains ozone (O<sub>3</sub>), NO<sub>x</sub> and other gases depending on the composition of the sample gas. Exhaust must be able to freely flow and must not build up back pressure.



*Type A or type B connectors are alternatives. Either the Analyzer is fully equipped with type A connectors or it is fully equipped with type B connectors. Mixed configurations with both type A and type B-connectors are not available.*



*All pressures stated must be reached directly at the gas connectors. The flow through the analyzer follows the input pressure.*

## 3.1.5 Interface Data

### Analog Output / Relay Output (X1)

Data	Value	Unit
Current, analog output	4 (0) – 20	mA
Burden ( $R_B$ ), analog output	< 500	$\Omega$
Current, relay output	1	A
Voltage, relay output	30	V DC
Load, relay output	30	W



Connect only secondary SELV circuits that under normal and single fault conditions, do not exceed safe values between any two connected components.

### Digital Output

Data	Value	Unit
Voltage, max	30	V
Current, max	1	A
Power, max	30	W

### Analog Input

Data	Value	Unit
Burden ( $R_{in}$ )	100	k $\Omega$
Burden ( $R_{in}$ ), wire bridged**	50	$\Omega$
Voltage, range 1*	0 – 1	V DC
Voltage, range 2*	0 – 10	V DC
Input current, wire-bridged**	0 – 20	mA
Overload protection, voltage	$\pm 15$	V DC
Overload protection, current	$\pm 20$	mA

\*Ranges can be selected in the software menu.

\*\*Optional, if wire bridge is fitted.



Connect only secondary SELV circuits that under normal and single fault conditions, do not exceed safe values between any two connected components.

## 3.1.6 Enviromental Conditions

Data	Value	Unit
Humidity, at 20°C (68°F)	< 90	% (RH)
Humidity, at 40°C (104°F)	< 70	% (RH)
Employment height, max*	2000 (6561)	m (ft)
Ambient temperature	5 – 45 (41 – 113)	°C (°F)
Pollution level, max	2	-

\*Above mean sea level.



The Analyzer may only be operated indoors in water and dust-protected environments. Use only in explosion-protected areas.

## 3.1.7 Emissions

### Dangerous Gas Concentrations



#### WARNING!

**Health problems due to possible harmful concentrations of gases in unventilated housings or control cabinets!**

If leakages occur and there is no ventilation, dangerous gas concentrations may occur after short periods of time.

## Leakage Rate



### WARNING!

If leakage is not tested, the stated leakage values are not accurate and may be much higher.

- Always perform leakage test as specified in this manual [Chapter 9.9 “Performing a Leakage Test” on page 187.](#)

Data	Value	Unit
Leakage rate, Helium*	< 13 (0.79)	ml/h (in <sup>3</sup> /h)



*The values stated above are only valid when tightness has been proven by a successful leakage test.*

*These values represent a theoretical maximum. After a successful leakage test the maximum helium leakage is below 13 (0.79) ml/h (in<sup>3</sup>/h). Due to molecule size properties, ozone and NO leakage will stay below this value.*

## Emission Data

Data	Value	Unit
Sound emission, housing fan	43	dB(A)
Sample gas, emission*	approx.2000 (122.05)	ml/h (in <sup>3</sup> /h)
Air flow, housing fan	0.88 (31.1)	m <sup>3</sup> /min (CFM)

\*Contains ozone (O<sub>3</sub>), NO<sub>x</sub> and other gases depending on the composition of the sample gas.

## Room Ventilation Requirements

Data	Value	Unit
Air extraction, minimal*	0.88 (1.15)	m <sup>3</sup> /min (yd <sup>3</sup> /min)

\*The room air extraction flow must exceed the air circulation of the housing.

## 3.2 Spare parts Data

### 3.2.1 Storage Battery Data

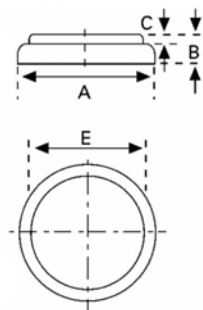


Fig. 35: Battery

Data	Value	Unit
Type Number	6032	-
Designation IEC	CR 2032	-
System*	LiMn	-
UL Recognition	MH 13654 (N)	-
Nominal Voltage	3	V
Typical Capacity C**	230	mAh
Weight, approx	3 (0.1)	g (oz)
Volume	0,95 (0.058)	cm <sup>3</sup> (in <sup>3</sup> )
Temperature, Storage (min)	-55 (-67)	°C (°F)
Temperature, Storage (max)	70 (158)	°C (°F)
Temperature, Discharge (min)	-20 (-4)	°C (°F)
Temperature, Discharge (max)	70 (158)	°C (°F)
Diameter, overall (A)	19.7 – 20 (0,78 – 0.79)	mm (in)
Height, overall (B)	2,9 – 3.2 (0.11 – 0,13)	mm (in)
Diameter, shoulder (E)	18.3 (0,72)	mm (in)
Height, shoulder (C)	0.7 (0,03)	mm (in)

\*Li-Manganese dioxide / Organic Electrolyte.

\*\* Load 5.6 kOhm, at 20 °C (68 °F) down to 2 V.

## 3.2.2 Electrical Fuse Data

### IEC-Connector Fuse

Data	Value	Unit
Mains Cardrige Fuse*, dimensions	5 x 20 (0.2 x 0.79)	mm (in)
Mains Fuse, trip current	4	A
Mains Fuse, nominal voltage	250	V
Mains Fuse, breaking capacity	1500 A @ 250 VAC	-

### Internal Power Supply Fuse

Data	Value	Unit
Internal Cardrige Fuse*, dimensions	5 x 20 (0.2 x 0.79)	mm (in)
Internal Fuse, trip current	3.15	A
Internal Fuse, nominal voltage	400	V DC
Internal Fuse, breaking capacity	1500 A @ 400 VAC	-



*\*Fuses are available from Emerson. Only use fuses listed in the spare parts list ↗ “Fuses” on page 227.*



## 4 Measuring Principles

### Chemiluminescence Reaction

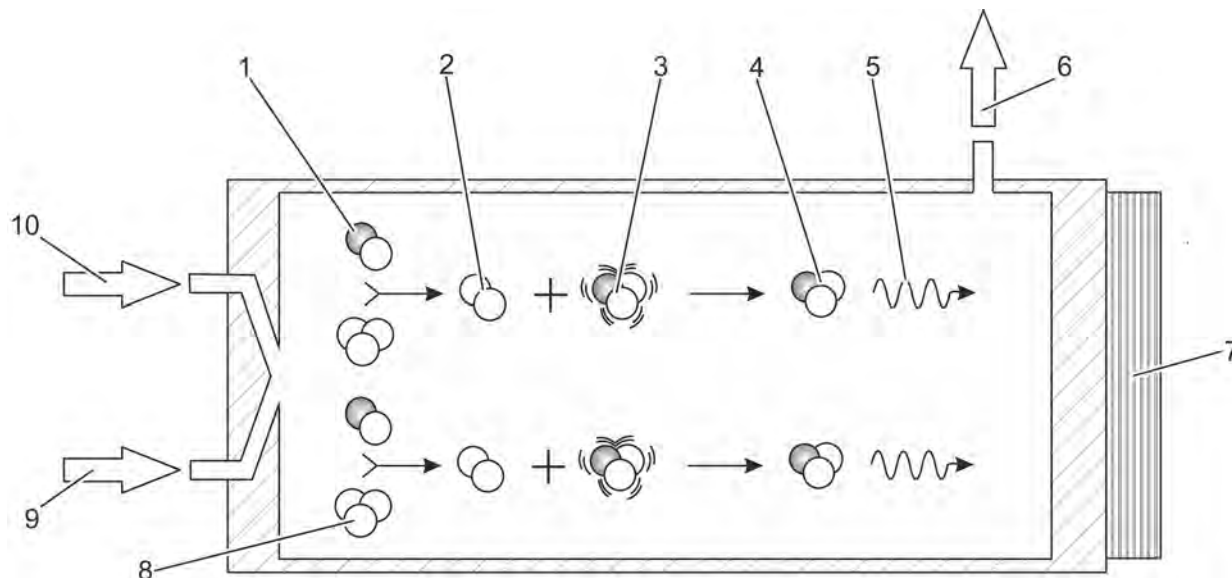


Fig. 36: Chemiluminescence reaction (schematic)

- |                                      |                           |
|--------------------------------------|---------------------------|
| 1 NO molecule                        | 6 Exhaust                 |
| 2 O <sub>2</sub> molecule            | 7 Photo diode             |
| 3 NO <sub>2</sub> molecule (excited) | 8 O <sub>3</sub> molecule |
| 4 NO <sub>2</sub> molecule           | 9 O <sub>3</sub> Inlet    |
| 5 Photon                             | 10 NO Inlet               |

The measuring principle is based on the chemical reaction of ozone and nitrogen oxide leading to a chemiluminescence reaction of nitrogen dioxide.

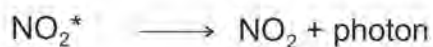


Fig. 37: Chemiluminescence reaction (equation of reaction)

Nitrogen oxide and ozone react to nitrogen dioxide and oxygen. In some cases this reaction can form nitrogen dioxide in electronically excited state (NO<sub>2</sub><sup>\*</sup>). This excited nitrogen dioxide molecule reverts immediately to a ground state and emits a photon. This behavior is called chemiluminescence.

The photon is detected by a photo diode. Using the correct sample and ozone pressure, the number of the detected photons is proportional to the concentration of nitrogen oxide in the sample gas.

### To measure $\text{NO}_x$

To Measure  $\text{NO}_x$  ( $\text{NO} + \text{NO}_2$ ) any  $\text{NO}_2$  in the sample is reduced to  $\text{NO}$  (at <95% efficiency) by being continuously passed through a heated bed of vitreous carbon (this occurs before the sample gas is presented to the ozone).

Any  $\text{NO}$  initially present in the sample passes through this converter stage unchanged before being routed to the reaction chamber.

## 5 Startup

### 5.1 Introduction

#### Single-channel operation only



*The software shares some features for the use of multi-channel units with other analyzers from the XSTREAM analyzer family. For the XECLD, these features are not applicable. The XECLD is only available with one measurement channel.*

Once the unit has been unpacked and installed, it is recommended to first check the settings, and if necessary, adjust them to satisfy user requirements. For example:

- Is the hardware installed per that required?
- Is the unit configured as required (alarms, inputs, outputs, and so forth.)?

In order for the information in this chapter to be of any relevance, the unit must have been installed according to the instructions in chapter 4.

Before starting to follow the steps described on the next pages, we recommend to carry out a leakage test for the gas paths (containment system), to ensure the instrument is in good condition (☞ *Chapter 9.9 “Performing a Leakage Test” on page 187*).

The following pages describe how to navigate through the menus and what is to be observed when configuring the unit. For the first startup after installation, follow the step-by-step instructions for navigating the menus, allowing you to familiarize yourself with the unit and its software, and if necessary adjust the settings to your own requirements.

## 5.2 Front Panel Elements

All X-STREAM XE gas analyzers feature an easy-to-use graphical user interface, which displays measurement values, status and error messages, and menus for the input of parameters. For ease of use, the operator can select one of three languages for the display. By default, all analyzers are configured with English and German language sets, while a third can optionally be added. Languages currently available are: English, German, French, Spanish, Italian, Portuguese and Polish. The units are operated by six keys on the front panel.



Fig. 38: Enhanced front panel

### 5.2.1 Display

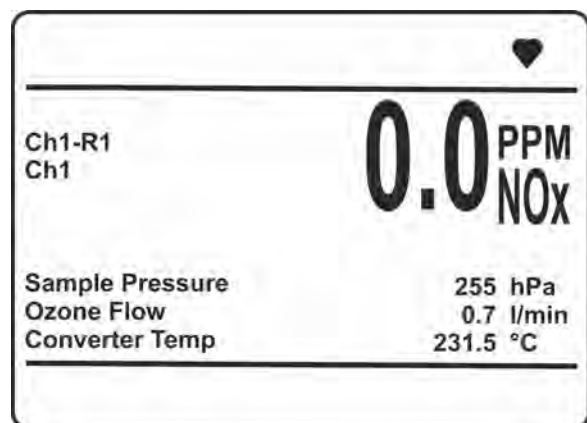


Fig. 39: Main Screen

The measurement display can be configured to display various layouts. The figures exemplarily show a layout (Fig. 39) with additional information and differing letter sizes.

### 5.2.2 Status Line and Text Message Line

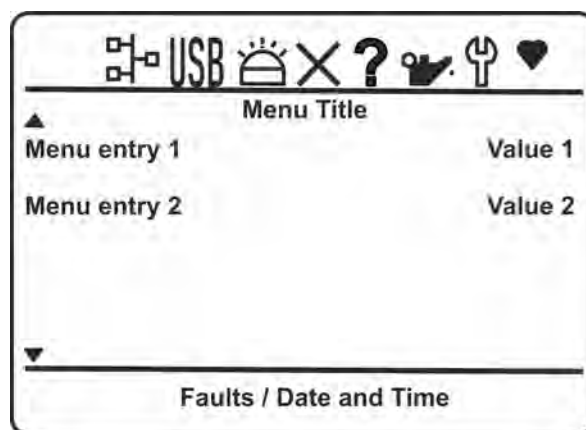


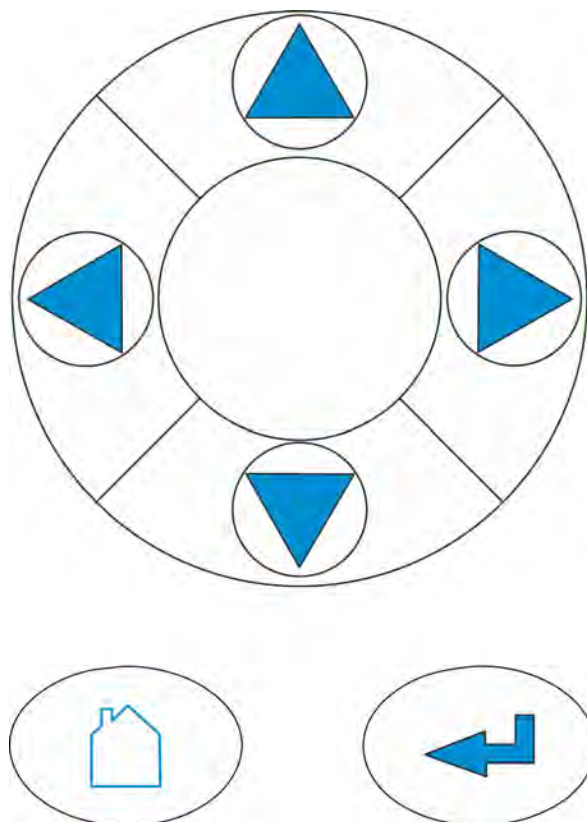
Fig. 40: Status information

Status information is provided by different icons in the display's first line:

Symb ol	Meaning
	Analyzer is remotely accessed
<b>USB</b>	USB device is attached
	Alarm
	Failure
	Off spec
	Maintenance request
	Function check
	The analyzer's 'heart beat', indicating the instrument is operating.


Clear text messages appear in the bottom line, replaced by current analyzer date and time information if there are no messages to be displayed.

### 5.2.3 Keys






*Fig. 41: Softkeys*

Six softkeys enable the use of the menu system. Depending on the active operational mode (measuring, browsing menus, editing) they have the following functions:


ENTER Key	Mode	Function
	Measuring	Enter main menu
	Browsing	Open submenu (..) or execute command (!)
	Editing	Confirm new entry

HOME Key	Mode	Function
	Measuring	(no function)
	Browsing	Return to measurement display
	Editing	Abort entry

UP/DOWN keys	Mode	Function
	Measuring	Enter main menu Highlight next menu line
	Browsing	Open the previous/next page, when a line beginning with ▲/▼ is highlighted
	Editing	Change current parameter

LEFT key	Mode	Function
	Measuring	Enter main menu or open second measurement display page (if configured)
	Browsing	Return to the parent level in the menu system
	Editing	Move cursor 1 char to the left Leave channel selection Cancel editing of given parameter Go to previous menu page, if ▲ shows in first menu line



RIGHT key	Mode	Function
	Measuring	Enter main menu or open second measurement display page (if configured)
	Browsing	Open submenu (..)
	Editing	Go to next menu page, when ▼ shows in last menu line Move cursor 1 char to the right

## 5.3 Software

The analyzer software displays measurement results and status messages, allows parameters to be set and edited, and maintenance functions (e.g. calibration or validation) to be carried out.

The software is organized hierarchically: The top-most level is called MEASUREMENT DISPLAY, followed by a MAIN MENU; all other menus and submenus are arranged below.

Menu lines can perform different functions, distinguished by the following characteristics:

Function	Description
Text	Simple text (not selectable with cursor).
Editable variables/parameters	<p>A variable description displays a colon; the line can be made up of up to three elements:</p> <ul style="list-style-type: none"> <li>■ description</li> <li>■ value (number or text)</li> <li>■ unit (optional)</li> </ul> <p>Examples:</p> <p>Span gas: 2000 ppm</p> <p>Tol.Check: Off</p> <p>Pressing ENTER in an editable variable line highlights the value to be changed.</p> <p>The optional unit can only be changed using a setup menu.</p> <p>Variables shown without a colon cannot be edited. They are for information only.</p>

Function	Description
Executable command	<p>A command line text ends in an exclamation mark; pressing ENTER with such a line highlighted, the command is executed, e.g. a calibration procedure.</p> <p>Example:</p> <p>Start calibration !</p>
Selectable submenu	<p>A menu line text ends in two dots. Press enter with a menu line highlighted to open the submenu.</p> <p>Example:</p> <p>Setup..</p>

### Browsing

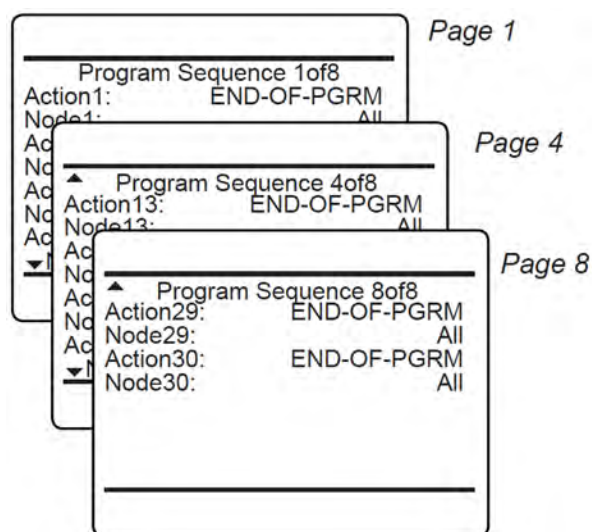


Fig. 42: Browsing

Some menus have more entries than can be displayed at once. In these menus, an indicator in the last (▼) and/or first (▲) line indicates the direction the menu continues.

In the example (Fig. 42):

- page 1 continues downwards
- page 4 continues upwards and downwards
- page 8 continues upwards.

To show the next page (indicator ▼ )

- place the cursor in the last accessible line and press DOWN or
- press RIGHT, irrespective of where the cursor is located.

To show the previous page (indicator ▲ )

- place the cursor in the first accessible line and press UP or
- press LEFT, irrespective of where the cursor is located.

## Editing

The editing mode enables changing parameters. It is initiated by pressing ENTER.

If the selection is a parameter list, the current entry is highlighted and may be changed by using UP and DOWN.

If the selection is a value, the cursor is placed over the last character.

Use UP and DOWN to change it.

Use LEFT and RIGHT to select another character.

The type of available characters depends on the position of the cursor:

- It is not possible to select the minus sign or decimal point as the last character.
- It is not possible to select the decimal point in integer values.
- For decimal numbers, the decimal point can be placed anywhere, within certain limits.

There are two ways to exit the data entry mode:

ENTER: the entry is verified. If it is accepted, it is saved and the new value displayed; if not, an error message is displayed.

HOME: Cancels all settings and changes are reset to their former values.

## Component selection menu

Within the analyzer software, analyzer-related and component-related menus can be distinguished from one another as follows: the first contains entries, relevant to the analyzer (e.g. time setting), the second contains entries relevant to the measurement channel.

### 5.3.1 Access Levels and Codes

Access levels can be used to prevent changes to parameters by unauthorized personnel.

The X-STREAM menu system supports four prioritized access levels, which can be activated and deactivated separately, and should be supplied with their own access codes.

**Level four** has the highest priority and is used for factory settings — only qualified EMERSON service personnel have access to this level.

**Level three** gives access to system admin parameters, e.g. for configuring data acquisition systems communication.

**Level two** allows the expert settings, e.g. basic settings for calibrations and measurements.

**Level one** is the user level and includes:

- parameters which should be set by trained personnel only.
- functions, not to be started by any person (e.g. start calibrations).

All menus not assigned to one of these levels are not editable or are of minor relevance.

Within this manual the descriptions of the menus and procedures also indicate, which level the menus are assigned to. These assignments cannot be changed.

Access codes for Levels 1 to 3 can be defined, activated and deactivated by the client. The analyzer is delivered with the following settings:

Level	Access Code	Status
1	00000001	Off
2	00000002	Off
3	00000003	Off

### ! NOTICE!

We recommend to set new access codes, if you want to use this option.



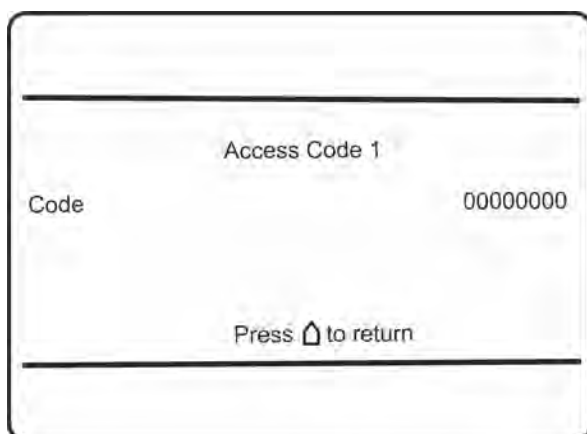
*If a low level is locked (status On), all higher levels will also be locked.*

*If a high level is unlocked (status Off, or code is entered when requested), all lower levels will automatically be unlocked also.*

*For above reasons, it is always possible to enter a higher code than requested to gain access to a menu (e.g. if access code 1 is requested, you may also enter access code 2).*

### Entering access codes

If an access code is required for a menu, a message similar to following appears:



To enter the code, press

- UP/DOWN to change the currently selected digit
- LEFT/RIGHT to select a different digit
- ENTER to submit the code

or

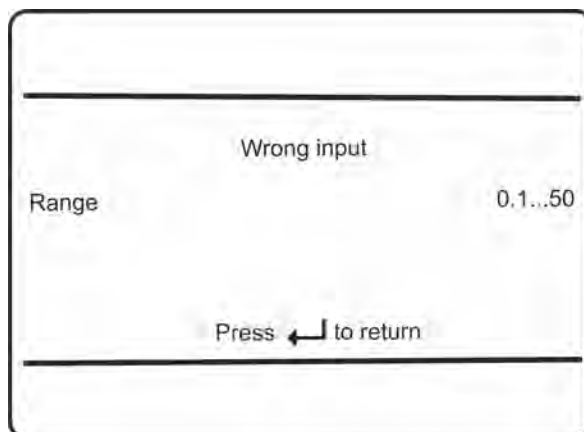
- HOME to exit edit mode and return to the previous display.

### 5.3.2 Special Messages

Depending on the last action performed by the user, one of the following messages may be displayed to assist or inform the user.

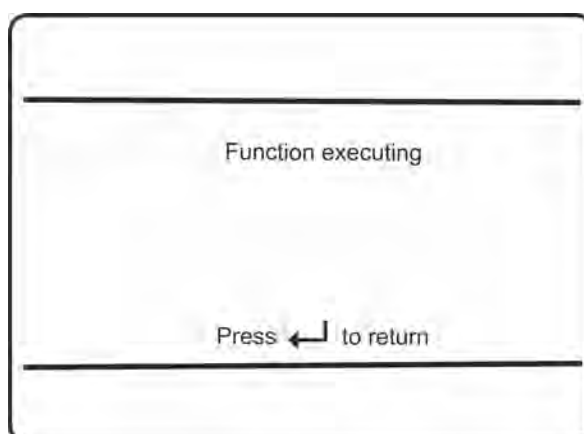
#### Information on incorrect entry:

The value entered by the user is outside valid limits. The display indicates the limits that apply. Press ↵ to return to the previous screen to enter an acceptable value.



#### Confirmation of execution of function:

Confirms that a function or procedure (e.g. calibration) has been started, or cancelled. The message automatically disappears after a few seconds.



## 5.4 Powering Up

### Summary of Powering Up Procedure

#### Personnel:

- Laboratory researchers
- System integrator
- Analyzer operator

Laboratory Researchers or System integrators are required on first startup. Once all parameters have been set, any Analyzer Operator may initiate startup procedure.

If parameters have to be adapted during later startup procedures, Laboratory researchers or System integrators will be required again.

Do not let Analyzer Operators adjust parameters unassisted.

1. ➤ Switch on Analyzer at the ON/OFF switch.

⇒



*A timer indicates the remaining time until booting procedure is completed.*

Analyzer begins the booting procedure:

- System initialization
- Self-check of software and analyzer components
- Network search

2. ➤ Wait until booting procedure has completed.

⇒ Display shows Measuring Menu. A Message displayed at the bottom indicates that Analyzer needs to heat up.

3. ➤ Let Analyzer heat up for at least 30 min (better: 60 min).

⇒ The analyzer is ready to take measurements when all temperature related messages have vanished.

4. ➤ Make sure all parameters are set according to the planned measuring task.

5. ➤ Make sure the exhaust line is connected securely.

6. ➤ Establish a sample gas supply and set pressure according to specified values.

7. ➤ Establish air supply.

⇒ Sample gas and air supplies flow into the analyzer. The exhaust line leads away.

8. ➤ If no error messages are displayed, the Analyzer is ready for calibration.

9. ➤ If error messages are displayed, eliminate the cause. Only proceed once error messages have been eliminated.

10. ➤ Perform desired calibration procedure  
 ➤ Chapter 10 "Calibration and Validation Procedures" on page 196.

⇒ Analyzer is fully powered up and calibrated. It may now be used to measure NO/NOx concentrations.

The setup menu enables several additional configurations, e.g.

- 2-pages measurement displays
- different font sizes.

The very first display line (Fig. 43) shows:

- a flashing heart, showing the instrument is operating-
- one or more icons to indicate analyzer status. Some of these are explained by a text message in the last line (see below).

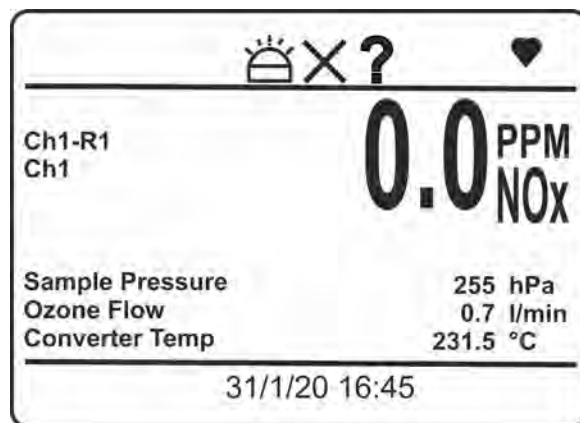


Fig. 43: Display

The bottom line of the display shows plain text status information (current date and time, errors, maintenance requests, function checks or off-spec performance).

Active messages are stored in an internal buffer. If there is more than one message in the buffer, the display will cycle through them.

Most messages also activate a NAMUR relay (if a relay has been assigned to that NAMUR function).



*There are also functions that activate a relay, but are not shown on the display.*

### 5.4.1 Boot Sequence

When the unit is powered up, a series of internal tests is automatically performed. During this time the front panel keys are disabled while the remaining time counts down in the display.

### 5.4.2 Measurement Display

The measurement display is shown:

- automatically on completion of the boot sequence
- when HOME is pressed
- automatically after a set period of inactivity (that is, keys have not been used).

The information to be provided in each of the four lines of the measurement display must be configured by an expert (access level 2):

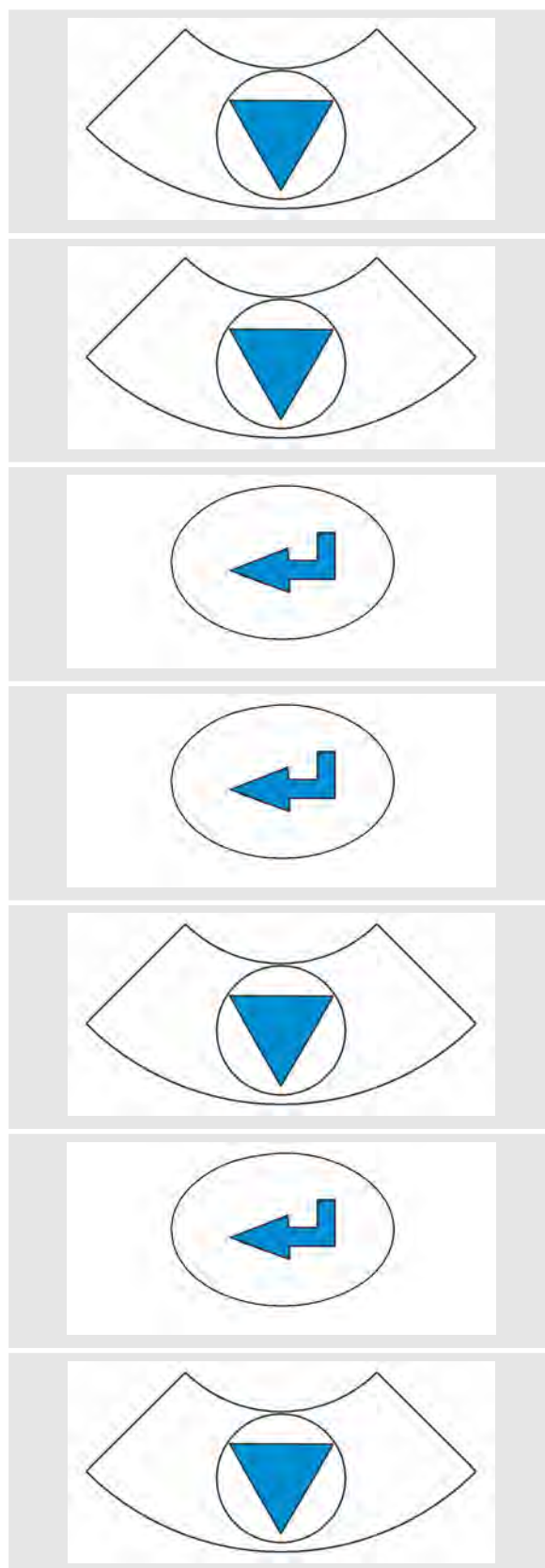
- measuring results and measuring units
- secondary measurements, e.g. pressure, gas flow, temperature
- nothing (empty line)

The factory settings are as follows:

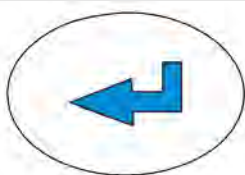
- Line 1: Measured value
- Line 2: Sample pressure
- Line 3: Ozone flow
- Line 4: Converter temperature (option)

## 5.5 Selecting the Language

If the analyzer is operational and it becomes clear that the incorrect language has been set, which is unintelligible to the operator, the following sequence of keypresses (starting at the measurement display) can be used to set the language.







If the system has been set up correctly, the code for access Level 1 must be entered at this point to enable access to the following menu.



*The factory setting for this unit is “no code required”. For ease of operation, it is recommended to use the factory settings for access codes while setting up the unit for the first time. In the following sections therefore, no more reference will be made to any need for entering a code.*

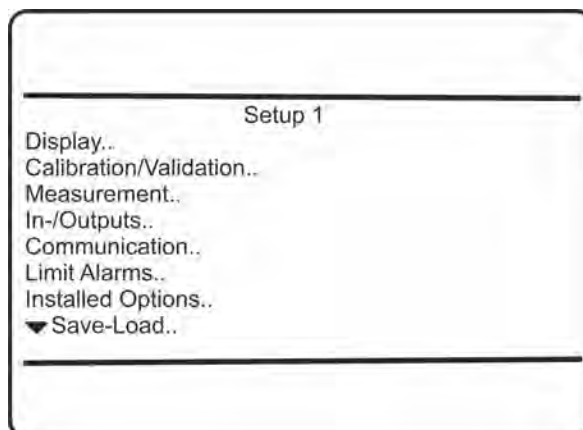


*Pressing ENTER for the third time in the main sequence, highlights the “Language” line.*

- DOWN changes the language.
- ENTER sets this language and the display is updated accordingly.
- If the selected language is not the intended, repeat the last three steps until the intended language is set.

## 5.6 Checking the Settings

The following sections are structured so that the user can work through them one by one after powering up the unit. After completing these steps, the unit will be configured to the user's needs and properly functioning.



Starting with the measurement display (↪ Chapter 5.4.2 “Measurement Display” on page 63), pressing any key except HOME will access the MAIN MENU. From here, follow these steps:



*If the display is showing anything other than the measurement display, press HOME to return to the measurement display first.*



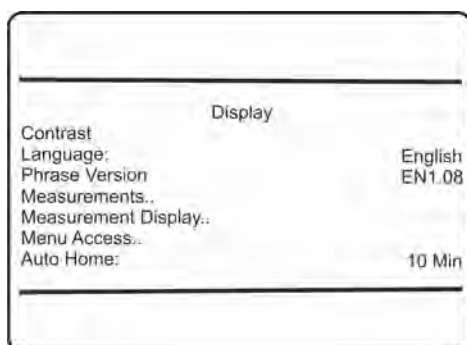
*If you are unfamiliar with the language settings: ↪ Chapter 5.5 “Selecting the Language” on page 63 shows the sequence of keys to set a different language.*

If the system has been set up correctly, the code for access Level 1 must be entered at this point to enable access to the following menu.



*The factory setting for this unit is “no code required”. For ease of operation, it is recommended to use the factory settings for access codes while setting up the unit for the first time. In the following sections therefore, no more reference will be made to any need for entering a code.*





Set the preferred language for the software.

## 5.6.1 Installed Options

All X-STREAM gas analyzers can be fitted with a variety of optional components. Follow the steps below to discover which options are available.

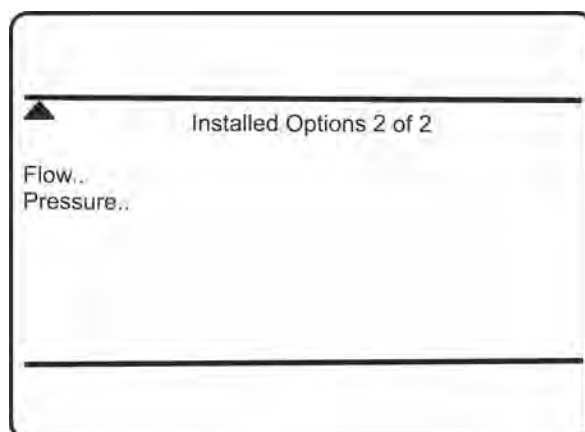
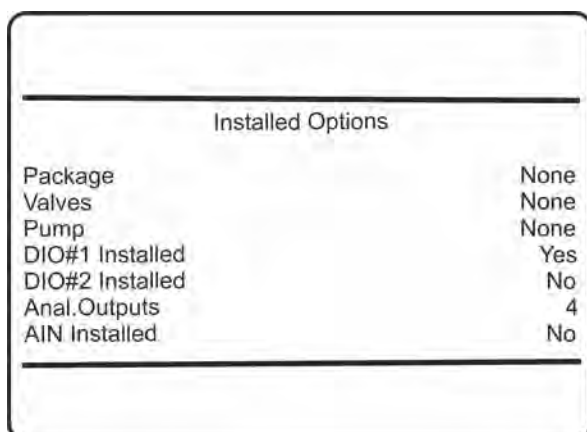
Press LEFT to return to SETUP, highlight "Installed options" and press enter.

### ! NOTICE!

Do not edit any entries in these menus without special knowledge.

Incorrect entries may result in incorrect results or impair the performance of the unit.

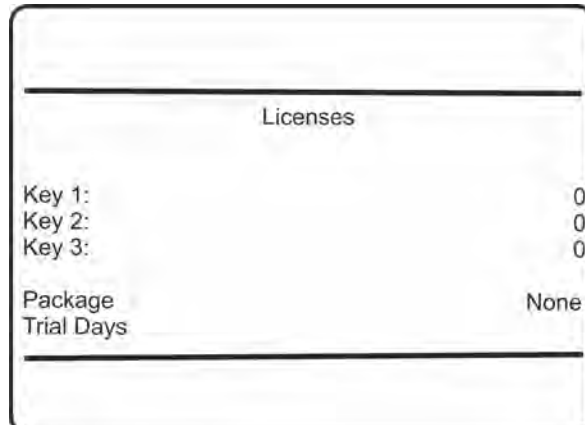
Initial access to this menu should be used to gain information on the configuration of the unit.



This 2-page menu indicates which optional components are installed in the unit. The values displayed on the unit may differ from those illustrated here.



*This menu may show options which are not available for the XECLD but for other devices of the XSTREAM analyzer family.*



"Licenses.." opens another menu where you can check or enter license codes to unlock optional software features.

## 5.6.2 Configuring the Display

Press LEFT to return to SETUP.

Check the settings for the measurement display, temperature and pressure units, and for menu access: press ENTER to open DISPLAY.., select "Measurement display.." and press ENTER.

If a setting does not meet your requirements, access that menu and adjust the parameter.

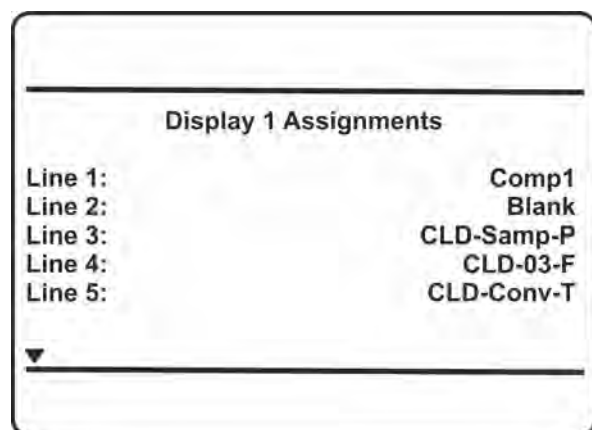


Fig. 44: Display assignments

Select the value to be displayed in each line of the measurement display. The following options are available:

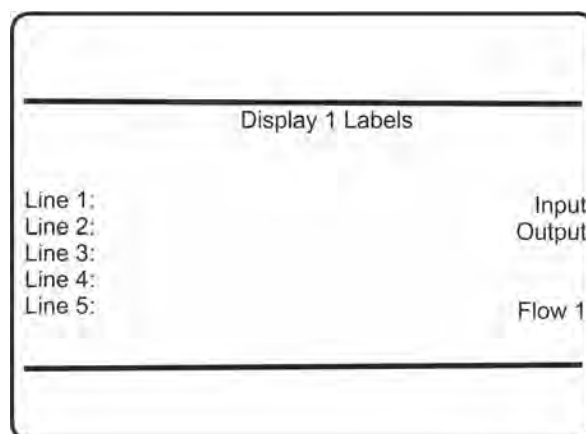
- Comp1
- Temp1
- Press1
- Flow1
- Blank (nothing)



The displayed example (Fig. 44) represents default settings.

Additionally the CLD-specific secondary variables are selectable:

- CLD-Samp-P
- CLD-03-F
- CLD-Conf-T
- CLD-Mfld-T
- CLD-Elect-T



When entering LABELS..., the channel's label may be changed, that is, the first text phrase in a line showing a measurement value. If nothing is entered here, the default phrase is used.




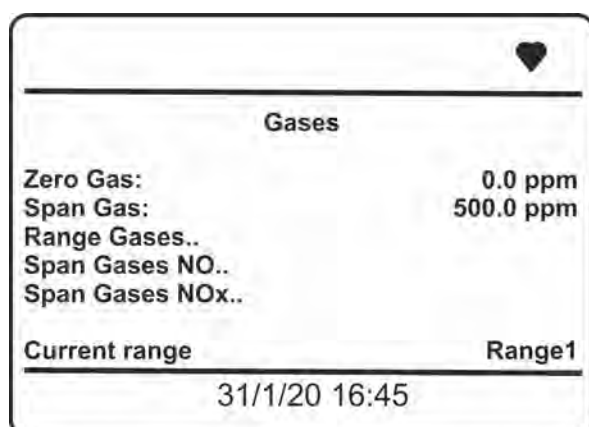
Notice the headlines of the menus showing a "1". This indicates that more than one display page can be set up.

### 5.6.3 Calibration/Validation Setup

Once the display settings have been checked, press left to return to SETUP and open CALIBRATION/VALIDATION to check the calibration and validation settings.



For more detailed information on calibration procedures: (  Chapter 5.7 "Performing a Calibration" on page 74).



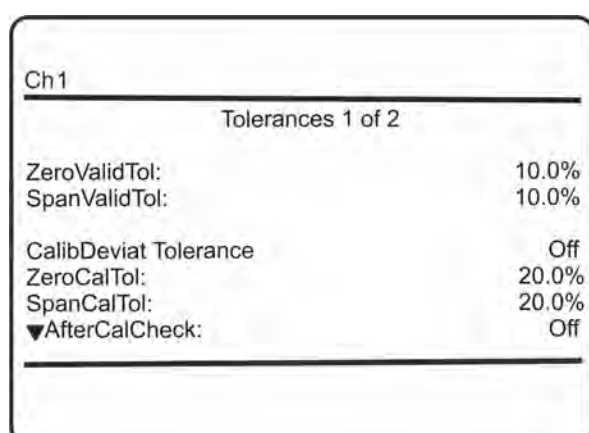
**Fig. 45: Gases**

In CALIBRATION/VALIDATION - GASES, enter the values for Zero Gas and Span Gas in the first two lines:

- See gas supplier's certificate for correct values.
- Values must be correctly set for results to be accurate.



*These two lines set zero and span gases for the current range and the selected mode of the XECLD (NO or NOx). If you want to configure multiple ranges or you want to use both measuring modes refer to the software chapter for a more detailed explanation of the configuration of the calibration gases.*



**Fig. 46: Tolerances 1 of 2**

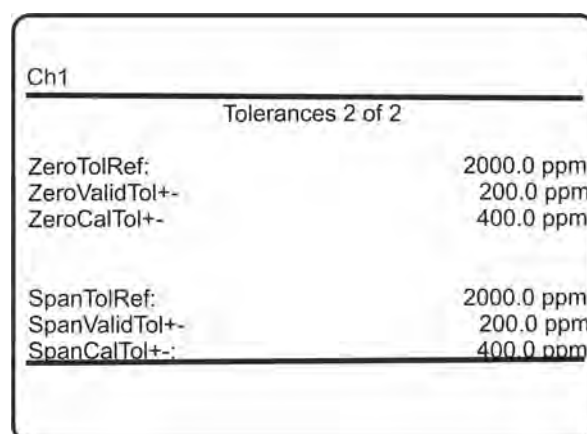
Press left to return to CALIBRATION/VALIDATION, and enter TOLERANCES .

By default the 'CalibDeviat Tolerance' check option is set to be inactive (Off).

With 'CalibDeviat Tolerance' set to On,

- during calibration the analyzer checks whether the values set for zero and span gas conform to the concentration of the gas currently being supplied.
- If the concentrations differ more than the percentage of range entered in the following lines, the calibration is aborted. This prevents calibration from being performed when the incorrect gas is supplied (e.g. span gas calibration using zero gas), which would result in an incorrectly configured unit.

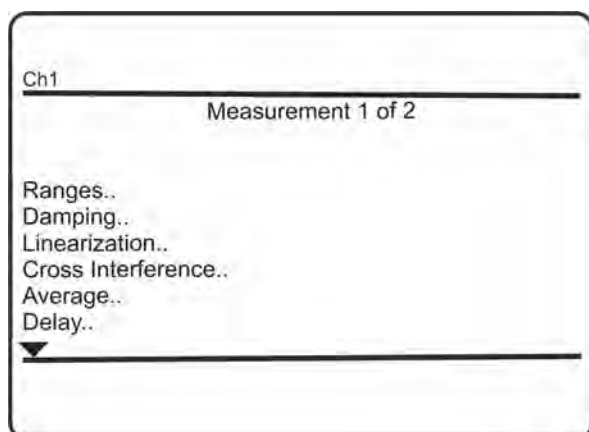
If "AfterCalCheck" is enabled (On), the calibration procedure adds an additional phase where it measures and stores the concentration value shortly after the calibration.



**Fig. 47: Tolerances 2 of 2**

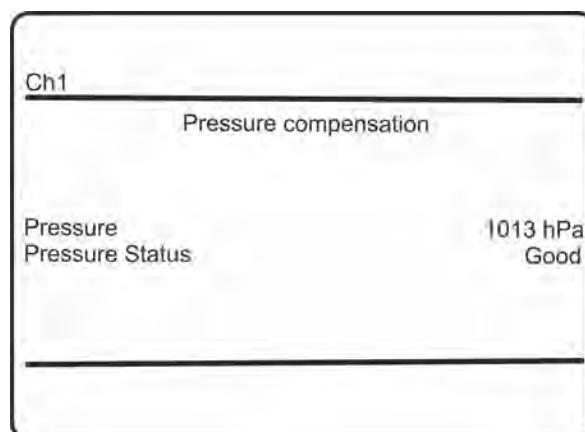
This menu shows the explicit concentration reference and limit values for the calibration and validation procedures for zero and span gas. They are calculated using the configured zero respective span gas values and their according percentage tolerance.

Press LEFT several times to return to SETUP and open MEASUREMENT.



Signal damping (set in DAMPING) enables smoothing of the output signal, but also affects the response time of outputs and display:

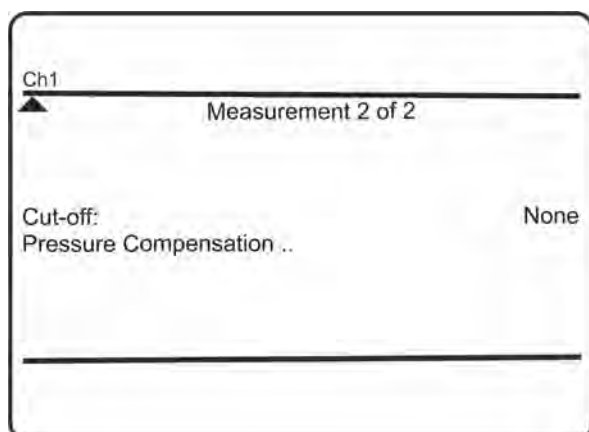
- The factory setting is dependent on the measuring range of the analyzer being used.
- The maximum possible  $t_{90}$  time is limited by the size of the internal sampling buffer and the sampling rate.



Since the XECLD always has an internal pressure sensor, no manual input of the pressure is required.

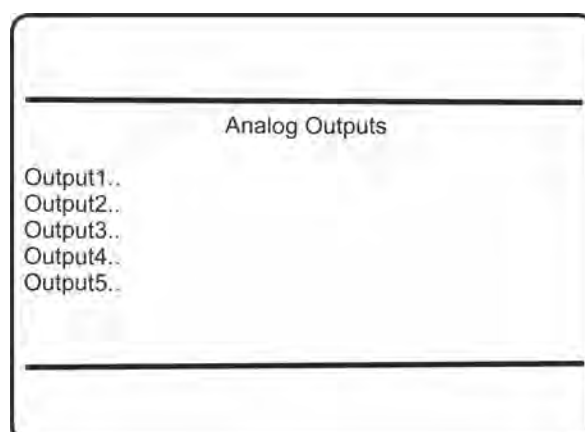
#### 5.6.4 Setting the Analog Outputs

Press LEFT to return to SETUP, and then open IN/OUTPUTS, and from there ANALOG OUTPUTS.



The last line of the second page (Pressure Compensation) enables the user:

- to view the current ambient pressure.



Select the analog output required to be checked.



*The following section only in brief describes the entries currently of interest! See software description & Chapter 6.2.3.4.1 "Set up Analog Outputs" on page 120 for more detailed information.*

Signal:	Comp1
OutRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

"Signal" specifies the value associated with the selected output. The following options are available:

Signal	Description
None	The analog output is deactivated.
0 / 4 mA	Either a 0 mA or 4 mA signal is generated, for example to be used to test the processing in a subsequent system. The actual type of generated signal is set up in the "Out range" line.
20 mA	A 20 mA signal is generated, e.g. to test the signal processing in a subsequent system.
Comp1	Gas concentration
Temp1	Temperature
Press1	Pressure
Flow1	Flow
Calc A...D	Result of calculator
RawVal1	Raw value
RangeID1...5	ID of selected range
CLD-NOx-Mode	Selected measuring mode
CLD-Samp-P	Sample pressure
CLD-O3-F	Air flow through ozonator
CLD-Conv-T	Converter temperature
CLD-Mfld-T	Manifold temperature

Signal	Description
CLD-Elect-T	Internal temperature of measuring module

Signal:	Comp1
OutRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

- Next, select the output range:
  - 0-20 mA (dead zero) generates a 20 mA signal if a concentration is measured at the upper limit of the signal range. A 0 mA signal is generated if the sample gas concentration equals the value specified with "LowScale".
  - 4-20 mA (live zero): A 4 mA signal is generated if the concentration equals the value specified with "LowScale", thus enabling to detect e.g. a broken cable.
- Enter a concentration, to equal the low output limit (0 or 4 mA).
- Enter a concentration, to equal the high output limit (20 mA).
- Enable (Yes) or disable (No) output autoscaling.
- "FailMode" selects the behavior of the output under failure conditions, considering or not, the NAMUR recommendation NE 43. NE 43 defines output signals enabling detection of different types of failures or status (Tab. 5-1). The related information is transmitted as a current signal, but outside the (0)4-20 mA measurement signal range.  
Available options:
  - Track: NE 43 not considered.
  - HIGH +10%: NE 43 failure signal level: "above".
  - LOW -10%: NE 43 failure signal level: "below".



*Factory setting is "Outrange:" 4-20 mA and "FailMode" LOW - 10%, unless set otherwise.*



*The related outputs signals can be fine-tuned on a second menu page if "Fail-Mode" is set to anything other than Track (next section).*



### Operational modes conforming to NAMUR 43 recommendations (NE 43)

The common modes for analog outputs do not support the detection of a failure in the measurement system. In such cases, the behavior of the output signal is undefined; either the last value is held, or a random value is sent. System failures cannot be detected by an external data capture system.

NE43 includes recommendations for such cases, but also for the configuration of analog outputs to detect other measurement states. X-STREAM analyzers incorporate these recommendations as follows:

Setting "FailMode" to HIGH + 10% or LOW - 10% defines specific analog output signals in case of a failure. Since these values are not output under normal operation conditions, a data acquisition system is enabled to distinguish between the following situations:

- valid measured value (signal within range),
- signal out of range (signal slowly rises or falls towards the limits given, and holds that value until the concentration returns to within the measuring range),
- failure (signal out of range, but not 0),
- severed cable (no signal [0 mA]).

Fig. 48 provides a summary of all available operational modes.

"OutRange"	"FailMode"	Failure signal level acc. NE 43	Output signal, if				
			Measured value is valid	Measured value is below lower limit ("Low scale")	Measured value is above upper limit ("High scale")	An internal failure occurred	Cable is severed
0-20 mA	Track	-	0...20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
4-20 mA	Track	-	4...20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
0-20 mA	LOW - 10 %	below	0...20 mA	-0.20 mA* (-1.80...-0.01 mA)**	20.50 mA* (20.01...21.50 mA)**	-2 mA	0 mA
4-20 mA	LOW - 10 %	below	4...20 mA	3.80 mA* (2.20...3.99 mA)**	20.50 mA* (20.01...21.50 mA)**	2 mA	0 mA
0-20 mA	HIGH + 10 %	above	0...20 mA	-0.20 mA* (-1.80...-0.01 mA)**	20.50 mA* (20.01...21.50 mA)**	> 21.7 mA	0 mA
4-20 mA	HIGH + 10 %	above	4...20 mA	3.80 mA* (2.20...3.99 mA)**	20.50 mA* (20.01...21.50 mA)**	> 21.7 mA	0 mA

Fig. 48: Analog output signals settings and operation modes



The application of values marked \* or \*\* depends on the setting of "Cut Mode".



Signal:	Comp1
OutRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

- "0/4 mA" enables to finetune the analog output: set "Signal" to 0 mA and, while measuring the output current, adjust it to the expected value.  
Accepted range: -10,000 ... +10,000
- "20 mA" enables to finetune the analog output: set "Signal" to 20 mA and while measuring the output current, adjust it to the expected value.  
Accepted range: -10,000 ... +10,000
- "Hold" selects the output's behaviour during calibrations.
- If set to Yes,
  - the analog output is fixed to the last measured value;
  - concentration alarms, which may otherwise be triggered by the concentrations of the calibration gases, are suppressed.
- If set to No,
  - the analog output signal always corresponds to the actual measured value during calibration; this may trigger alarms if limits are exceeded.



*This behavior may be undesirable if e.g. the unit is connected to a data acquisition system.*

### 5.6.5 Setting Concentration Alarms



*If concentration alarms are not being used, continue with Chapter 5.6.6 "Backup the Settings" on page 73.*

Press LEFT until SETUP is displayed, then open LIMIT ALARMS - CONCENTRATION

Ch1	
Concentration	
Alarm Monitor:	On
LoLo Level:	50.000 ppm
Lo Level:	100.000 ppm
Hi Level:	400.000 ppm
HiHi Level:	600.000 ppm
Hysteresis:	10.000 ppm
States..	

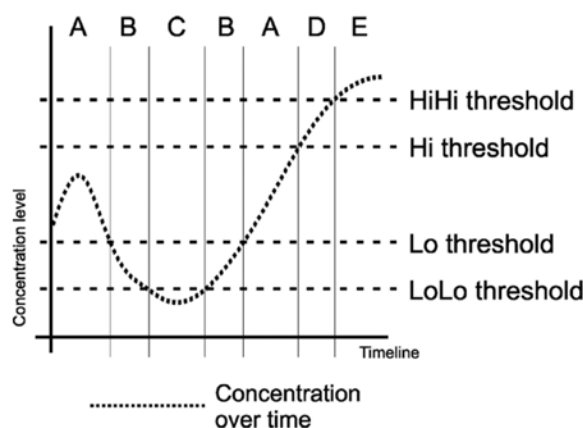


Fig. 49: Arrangement of concentration thresholds

Four concentration limits can be set:

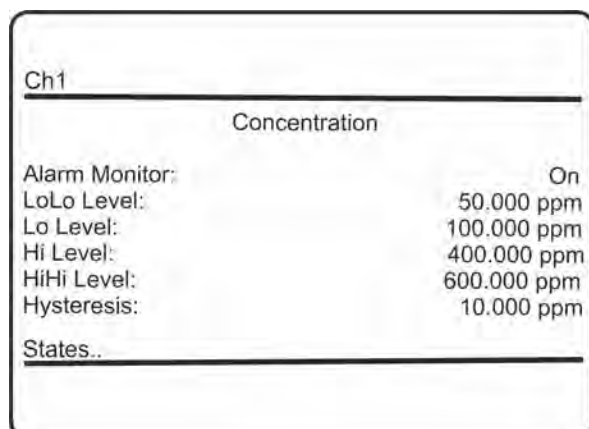
- "Lo" and "Hi" enframe the expected gas concentration
- "LoLo" equals or is below "Lo"
- "HiHi" equals or is above "Hi"

See the figure (Fig. 49) for an explanation. If you enter values for any threshold, the above given order has to be considered. A message is displayed if an entered value does not comply with this condition.



*HiHi and LoLo are main alarms, Hi and Lo are pre-alarms.*

Should the measured concentration go beyond one of the threshold levels (areas B, C, D and E in the figure), a message is displayed in the message line of the measurement display. The NAMUR pictogram appears (bell) and a corresponding digital output is activated, if assigned.



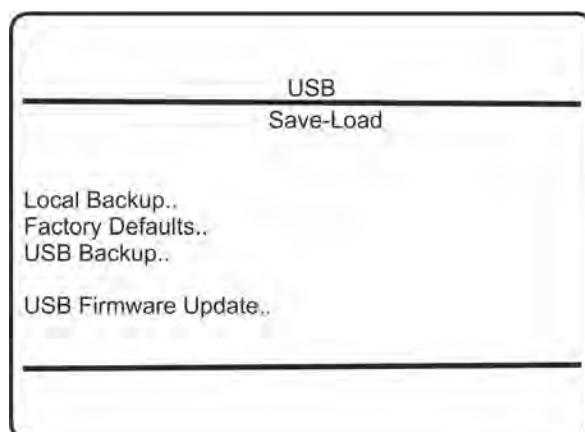
A hysteresis avoids oscillating alarms in case the concentration is fluctuating around a threshold.

You may turn the alarm function On or Off ("Alarm Monitor"). It is also possible to use some of the thresholds only. In this case, set the not used to a level outside the range limits (for this, "Lo" and "LoLo" support entering negative values). In case of an alarm, you may like to enter the STATES submenu, to check which one is triggered.

## 5.6.6 Backup the Settings

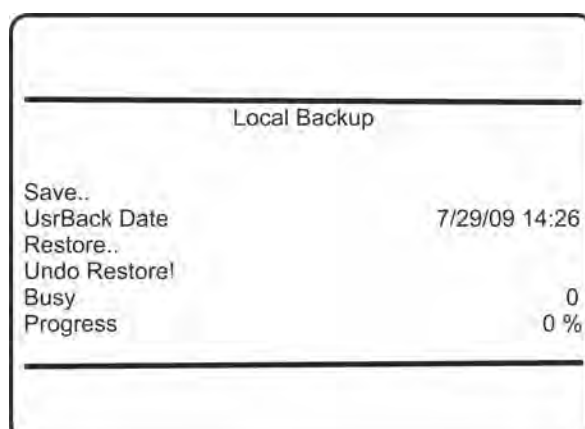
The most important settings have now been checked and the unit is configured to suite your needs. A backup copy of this configuration data can now be saved.

Press LEFT until SETUP and then open SAVE-LOAD.

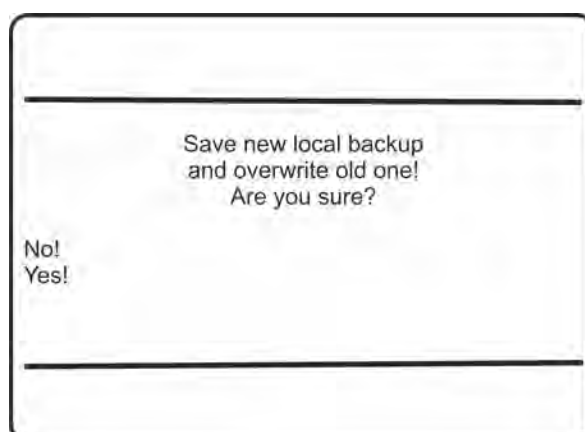


This menu provides the choice to either

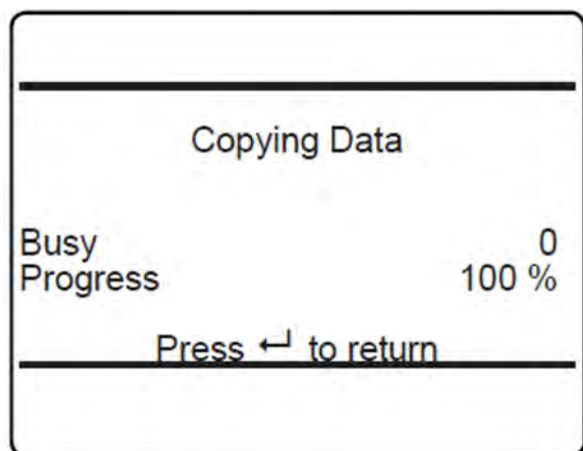
- make a local backup to a protected memory area
- restore the factory default settings, or
- make a backup to an external USB device.



For now, make a local backup: Enter LOCAL BACKUP and then select "Save..".



Confirm the operation (select "Yes!").



Wait until "Progress" shows 100 %, then press Copying Data ENTER to return to LOCAL BACKUP.

The check of the unit's settings has now been completed.

- Press HOME to return to the MEASUREMENT DISPLAY.

## 5.7 Performing a Calibration

After start up of the instrument, it is recommended to perform at least a zero calibration to ensure proper measuring results.





Refer to software description and procedures for a comprehensive description of calibration procedures.

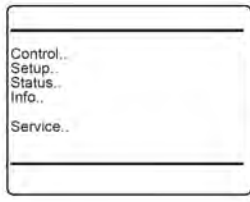
## 6 User Interface and Software Menus

This chapter describes the structure and content of the X-STREAM Enhanced XECLD software menus. While this chapter describes all software menus in hierarchical order, Chapters 5 and 7 explain by practical examples, how to navigate through the menus to perform certain basic setup operations, or maintenance functions.

### 6.1 Symbols and Typographical Conventions

In the following sections, the symbols and typographical conventions described below are used to describe the software menus and navigation.

Symbol	Decription
<b>Within Process Descriptions</b>	
Setup	Menu title
Setup.. Analog outputs..	Parent SETUP and current menu ANALOG OUTPUTS
Analog outputs.. Output1...5	As an example, the menu for Output1 is shown; the menus for outputs 2 to 5 look similiar.
Setup.. In/Outputs.. Analog outputs..	To access the current menu, access level code 3 has to be entered somewhere in the menu history.
	Access Level 1 (user)
	Access Level 2 (expert)
	Access Level 3 (administrator)
	Access Level 4 (service level)

Symbol	Decription
	MAIN MENU  Menu lines shaded in gray are optional variants or functions.

Convention	Description
<b>Within Text</b>	
MENU TITLE	For a detailed description of MENU, see page 6-12
CONTROL	Identifies the CONTROL menu, e.g. press ENTER to open CONTROL
CONTROL-RANGES	From within the CONTROL menu, select the RANGES menu
Valves.. Control..	Parameter or menu line name
Never, 1 min	Values to be selected
0 ... 2000	Value to be entered
ENTER	press key (here: ENTER key)

### 6.2 Menu System



*This overview only shows menu branches up to the 3rd menu level, not functions nor parameter lines. For example the lines “Pump” or “Lock menus” of the menu CONTROL are not shown. The XECLD analyzer shares common software with all XSTREAM Enhanced analyzers. The menu system of the analyzer has a dynamic behavior in that it does not show entries not supported by the current analyzer or configuration. Therefore, this overview might show entries hidden in your specific instrument.*



*This figure applies to software revision 1.7.x and later.*

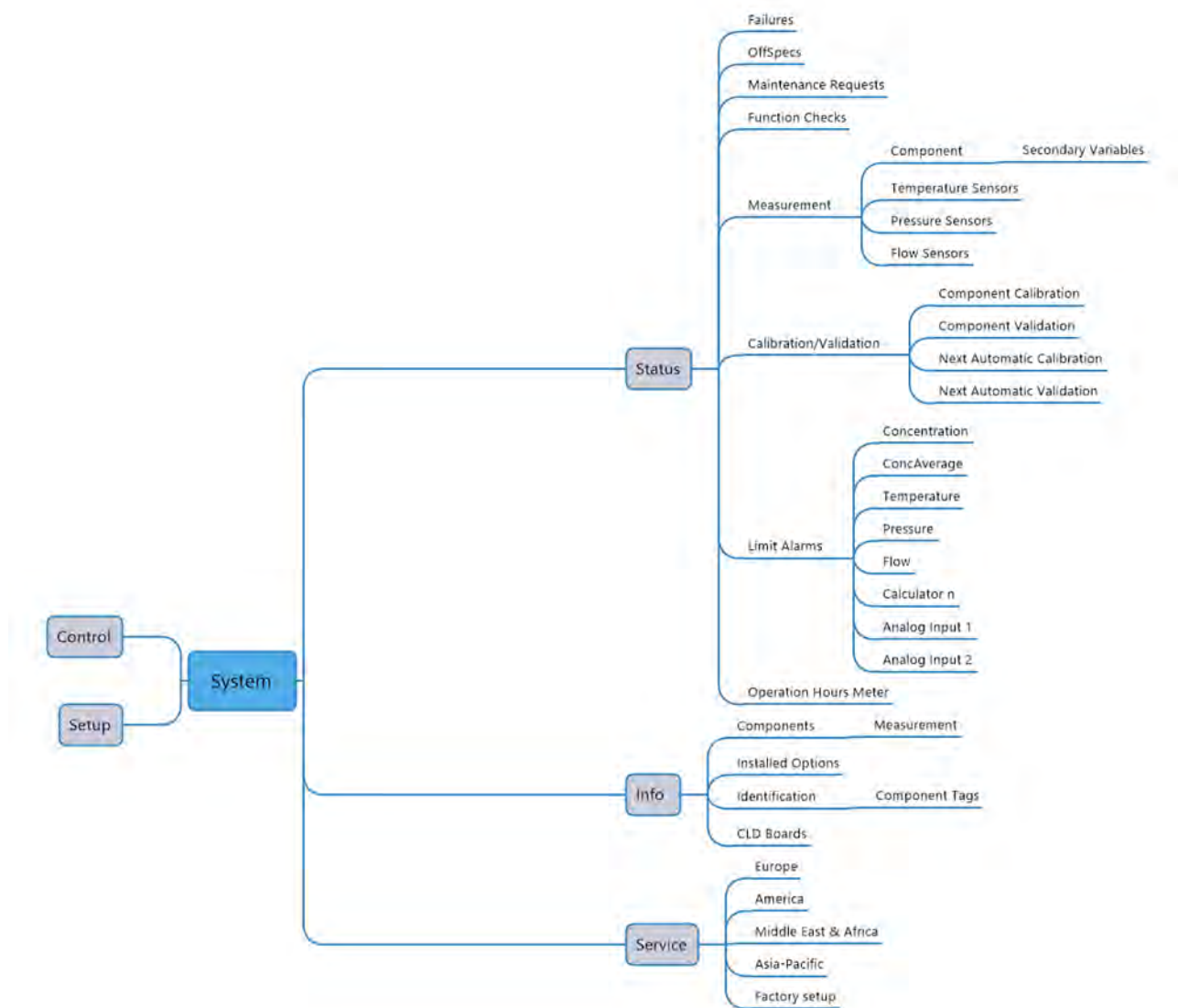


Fig. 50: Software menu structure

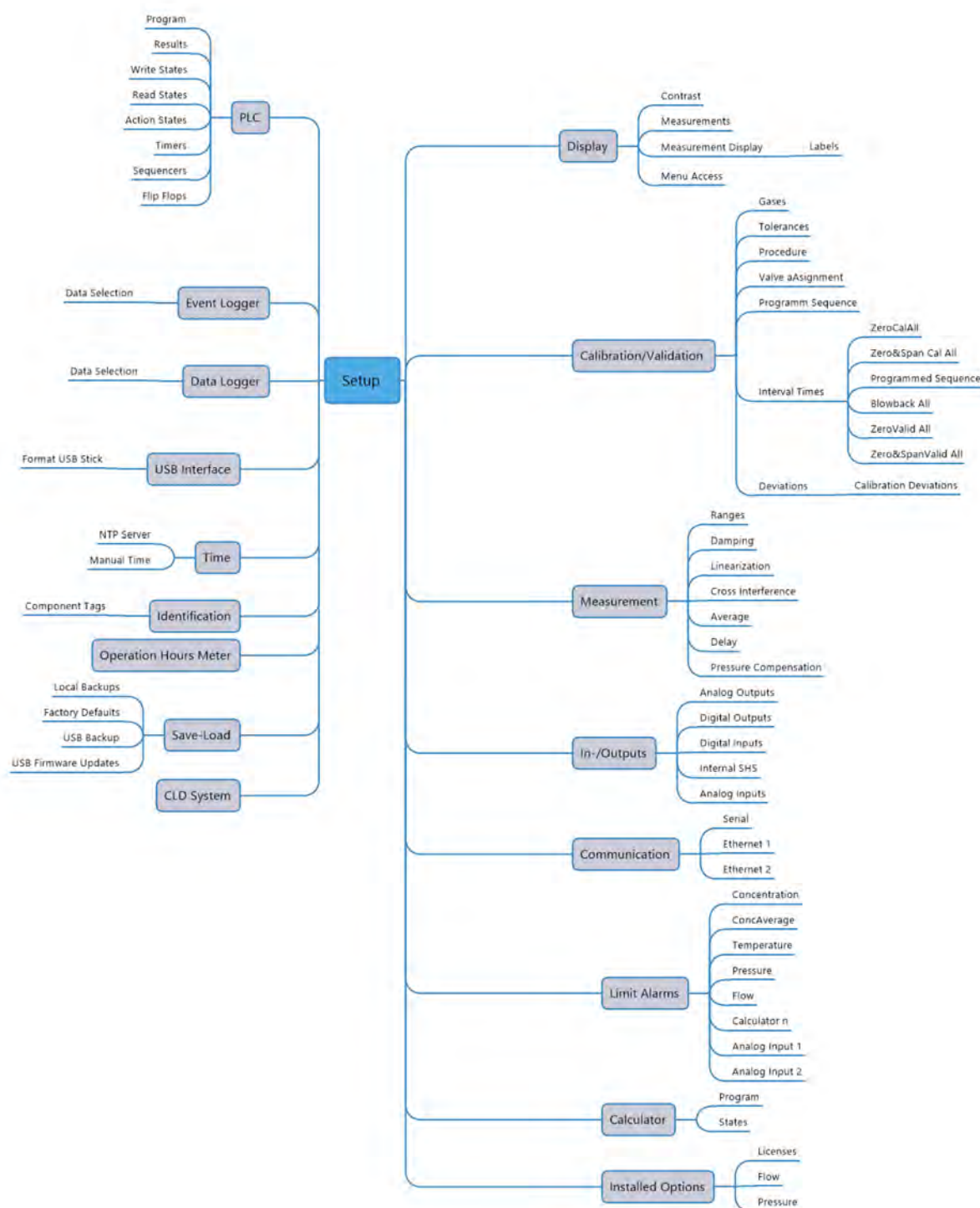


Fig. 51: Software menu structure (continued)



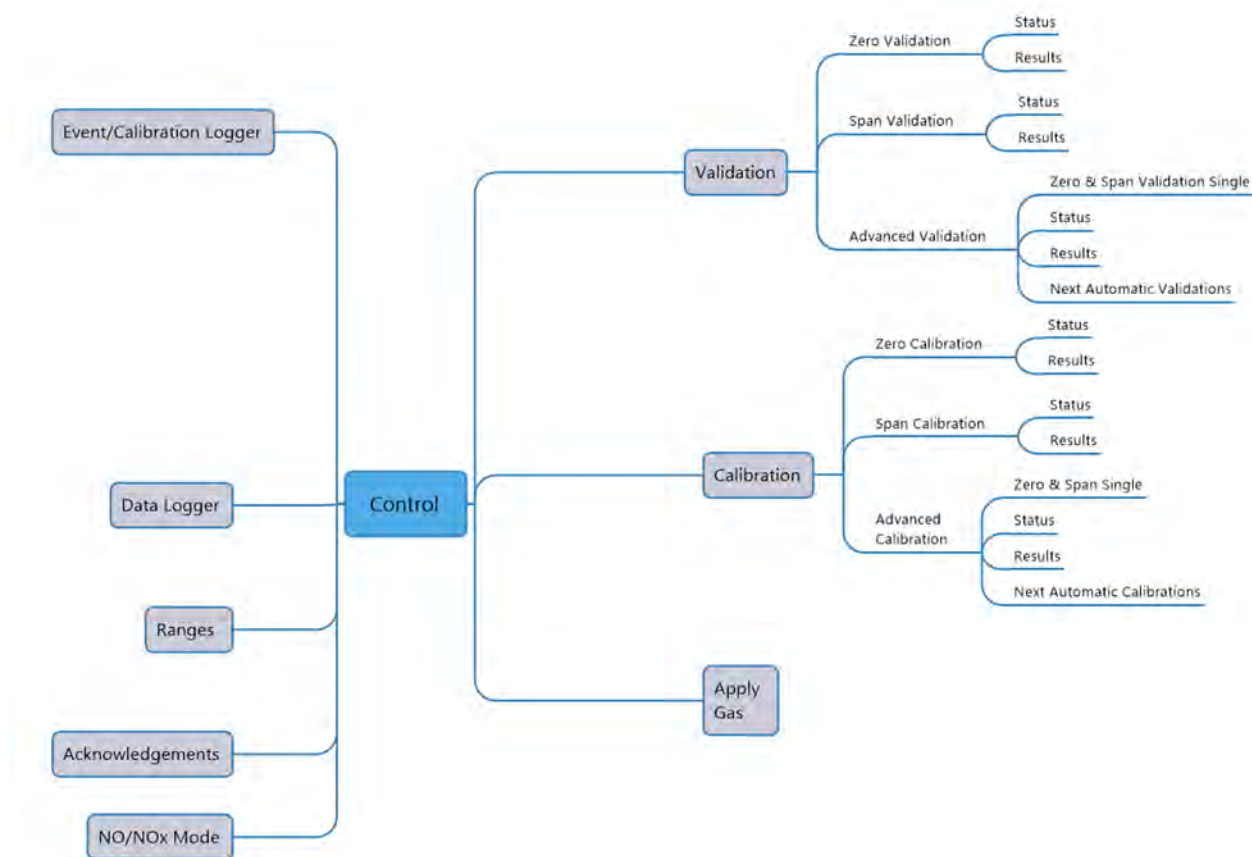
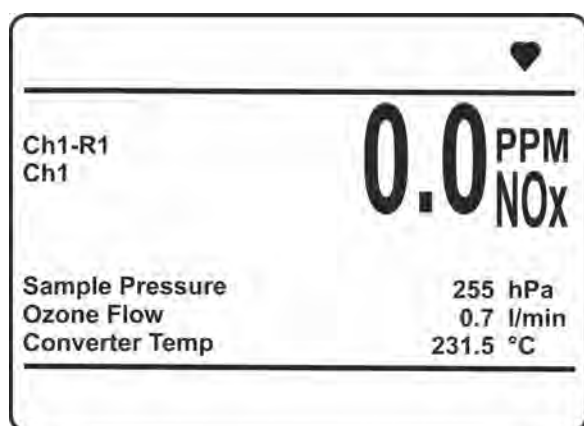


Fig. 52: Software menu structure (continued)

## 6.2.1 Switching On



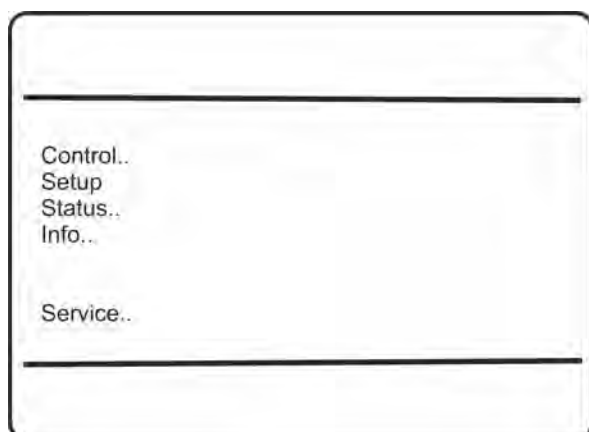
When the unit is powered up, a self-test (POST) is initiated, after which the unit shows the MEASUREMENT DISPLAY.



Clear text messages appear in the bottom line, replaced by current analyzer date & time if no messages are to be displayed.



Figures within this manual do not always consider displaying date&time or messages.



Press LEFT or RIGHT to switch to the MAIN MENU and select one of the main submenus:

- **“Control”**: Start functions or perform actions.
- **“Setup”**: Setup the instrument.
- **“Status”**: Get status information.
- **“Info”**: Some analyzer information.
- **“Service”**: Get service information.

## 6.2.2 Control Menu

“System → Control” (Page 1)

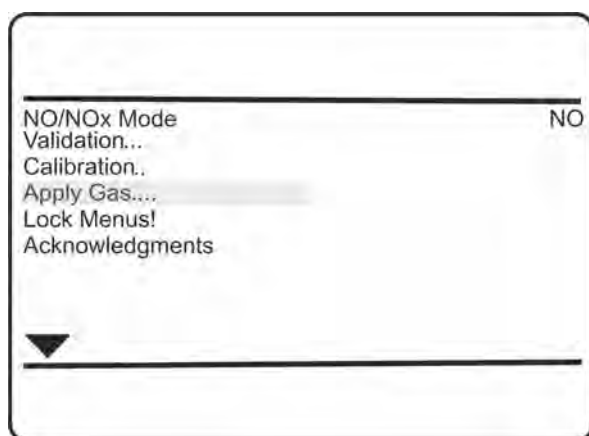
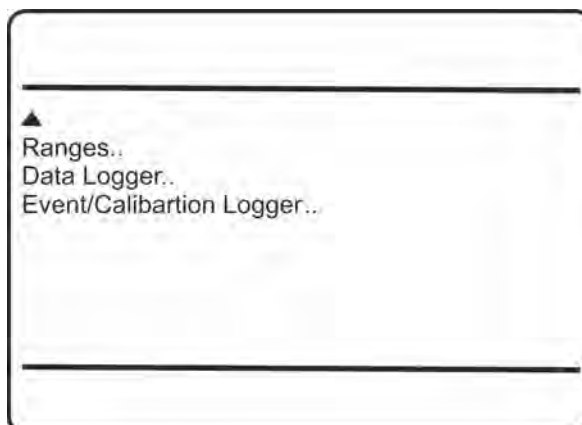


Fig. 53: Control Menu

- **“NO/NO<sub>x</sub> Mode”**: ‘Mode’ parameter (NO/NO<sub>x</sub>) is shown in the first line.
- **“Validation”**: Select the validation menu.
- **“Calibration”**: Select the calibration menu.
- **“Apply Gas”**: Optional: Apply gases.
- **“Lock Menus!”**: Press ENTER in this line to lock all menus, for which “Code” in MENU ACCESS has been set to On.
- **“Acknowledgements”**: Acknowledge messages.

“System → Control” (Page 2)



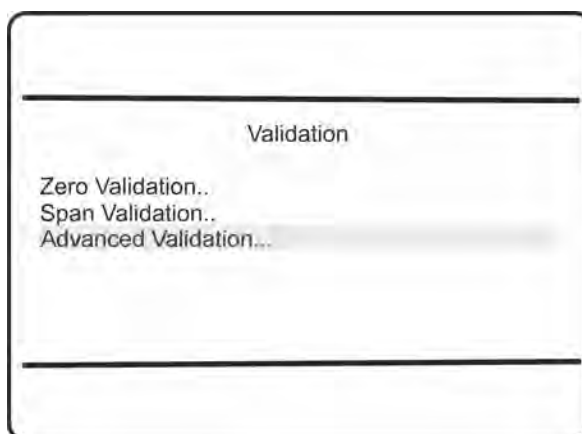
- **“Ranges”**: Set ranges.
- **“Data Logger”**: Handle data logger data.
- **“Event/Calibration Logger”** (optional): Handle event/calibration and validation logger data.

### 6.2.2.1 Validation Menu

“System → Control → Validation”

This menu allows the selection of a validation procedure.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



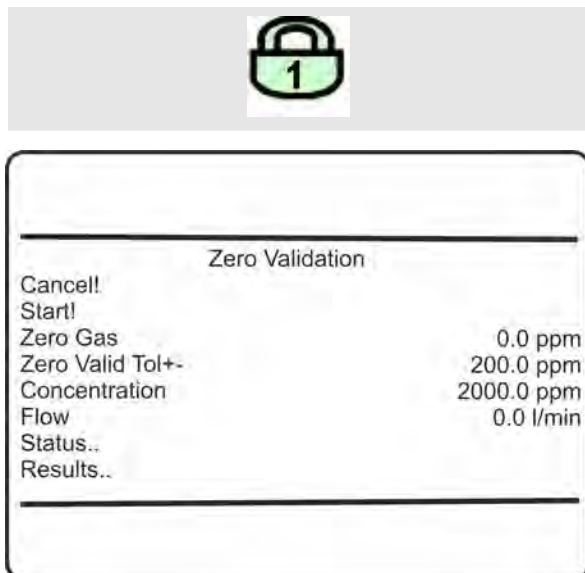
- **“Zero Validation”**: Perform a zero validation.
- **“Span Validation”**: Perform span validation.
- **“Advanced Validation”**: Optional: Perform advanced validation.

#### 6.2.2.1.1 Zero Validation Menu

“System → Control → Validation → Zero Validation”

This menu enables the start and control of a validation procedure for the zero gas.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



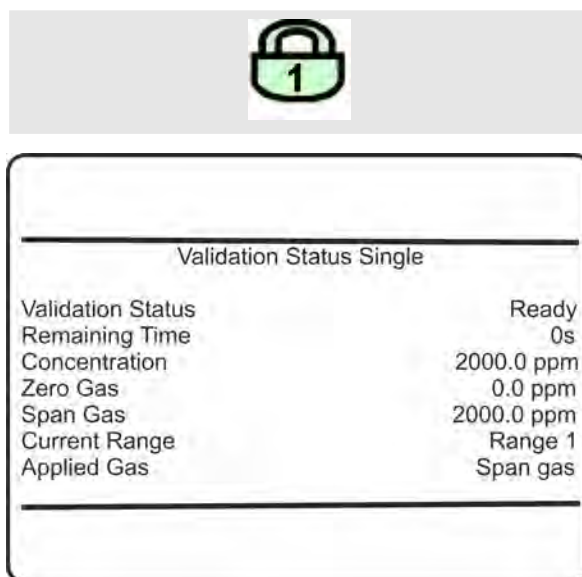
- **“Cancel!”**: Press ENTER to cancel any ongoing validation.
- **“Start!”**: Press ENTER to start a zero validation.
- **“Zero Gas”**: Nominal zero gas concentration.
- **“Zero Valid Tol+”**: Tolerances for the nominal zero gas concentration.
- **“Concentration”**: The current measured gas concentration.
- **“Flow”**: The current measured gas flow.
- **“Status”**: Open the submenu 'Status' to see validation status information.
- **“Results”**: Open the submenu 'Results' to see validation results information.

## 6.2.2.1.2 Validation Status Single

“System → Control → Validation  
→ Zero Validation → Status”

This menu gives a status overview.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **“Validation Status”**: The current ongoing procedure (Purging, Zeroing, Spanning, Ready).
- **“Remaining Time”**: Remaining time for the current procedure.
- **“Concentration”**: The current measured gas concentration.
- **“Zero Gas”**: The current channel's validation gases setup.
- **“Current Range”**: Range under validation.
- **“Applied Gas”**: The current applied gas type.

## 6.2.2.1.3 Validation Results Single

“System → Control → Validation  
→ Zero Validation → Results”

This menu gives a summary of results.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Validation Results Single	
Zero Result	Limit Exceeded
Zero Date	----
Span Result	Canceled
Span Date	----
ZeroValid Dev	0.0 ppm
SpanValid Dev	0.0 ppm

- **"Zero Result"**: Result type of last zero validation (Success, Cancelled, Timeout, Limit Exceeded, Bad Stability, OutOfLinRange, Not Allowed, Awaiting Span Cal, Sampling- Fail).
- **"Zero Date"**: Date of last zero validation.
- **"Span Result"**: Result type of last span validation (Success, Cancelled, Timeout, Limit Exceeded, Bad Stability, OutOfLinRange, Undefined Spangas, Awaiting SpanCal, Not Allowed, SamplingFail).
- **"Span Date"**: Date of last span validation.
- **"ZeroValid Dev"**: Deviation determined by last successful zero validation.
- **"SpanValid Dev"**: Deviation determined by last successful span validation.

#### 6.2.2.1.4 Span Validation Menu

"System → Control → Validation  
→ Span Validation"

This menu enables the start and control of a validation procedure for the span gas.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Span Validation	
Cancel!	
Start!	
Span Gas	
Span Valid Tol+-	
Concentration	
Flow	
Status..	
Results..	

- **"Cancel!"**: Press ENTER to cancel any ongoing validation.
- **"Start!"**: Press ENTER to start a span validation.
- **"Span Gas"**: Nominal span gas concentration.
- **"Span Valid Tol+-"**: Tolerances for the nominal span gas concentration.
- **"Concentration"**: The current measured gas concentration.
- **"Flow"**: The current measured gas flow, if a flowsensor is installed.
- **"Status"**: Open the submenu 'Status' to see validation status information.
- **"Results"**: Open the submenu 'Results' to see validation results information.

#### 6.2.2.1.5 Advanced Validation

"System → Control → Validation  
→ Advanced Validation"



*The Analyzer offers single channel operation only. Therefore, functionality of single channel advanced validation and all channel validation is identical.*

This menu enables the start and control of a valve supported validation procedures.



*This menu is only available if "Valves" in SETUP - INSTALLED OPTIONS is set to a value other than none.*

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Advanced Validation	
Cancel!	
Zero&Span Validation Single..	
Zero Validation All!	
Span Validation All!	
Zero&Span Validation All!	
Status..	
Results..	
Next Automatic Validations..	

- **“Cancel!”**: Press ENTER to cancel any ongoing validation.
- **“Zero&Span Validation Single”**: Open the sub-menu 'Zero & Span Validation Single' to carry out a zero and span validation for a single channel.
- Highlight any of the next three lines and press enter to start the related validation procedure:
  - **“Zero Validation All!”**: Zero all channels
  - **“Span Validation All!”**: Span all channels
  - **“Zero&Span Validation All!”**: Zero and span all channels
- **“Zero&Span Validation All!”**: Press ENTER: Starts a programmed validation sequence. For information on how to program a sequence ↪ *Chapter 6.2.3.2.6 “Set up Calibration and Validation Procedure” on page 106.*
- **“Status”**: Open the submenu 'Status' to see validation status summary for all channels.
- **“Results”**: Open the submenu 'Results' to see validation results summary for all channels.
- **“Next Automatic Validations”**: Open the sub-menu 'Next Automatic Validations' to view the scheduled dates for next automatically performed validation.

## 6.2.2.1.6 Zero & Span Validation Single

“System → Control → Validation  
 → Advanced Validation  
 → Zero&Span Validation single”

This menu enables the start and control of a valve supported validation procedure for zero and span.



Zero&Span Single	
Cancel!	
Start!	
Zero Gas	0.000 ppm
Span Gas	500.000 ppm
Concentration	0.000 ppm
Status..	
Results..	

- **“Cancel!”**: Press ENTER to cancel any ongoing validation.
- **“Start!”**: Press ENTER to start a zero & span validation procedure
- **“Zero Gas”**: Nominal zero gas concentration.
- **“Span Gas”**: Nominal span gas concentration.
- **“Concentration”**: The current measured gas concentration.
- **“Status”**: Open the submenu 'Status' to see validation status summary for the selected channel.
- **“Results”**: Open the submenu 'Results' to see validation results summary for the selected channel.

## 6.2.2.1.7 Validation Status Summary

“System → Control → Validation  
 → Advanced Validation → Status”

This menu gives an overview on the validation status.





Validation Status Summary	
Validation Status Single..	None
Current Action	--
Action Detail	0 s
Current Duration	0 s
Prev. Duration	0 s

- **“Validation Status Single”**: Open the submenu 'Validation Status Single' to see detailed validation status information for a specific component (to be selected in a next step).
- **“Current Action”**: The current ongoing procedure (Purging, Zeroing, Spanning, Ready, None).
- **“Action Detail”**: The current procedure, or Off.
- **“Current Duration”**: Remaining time for the current procedure.
- **“Prev. Duration”**: The duration of the previous procedure.

#### 6.2.2.1.8 Validation Results Summary

“System → Control → Validation  
→ Advanced Validation → Results”

This menu shows detailed information on validation results.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Validation Results Summary	
Execution	Performed
Any ZeroValidFail	Yes
Any SpanValidFail	No
Validation Results Single..	

- **“Execution”**: Information about whether the validation procedure has been performed.
- **“Any ZeroValid Fail” + “Any SpanValid Fail”**: Information about failures during the validation procedures.
- **“Validation Results Single”**: Open the submenu VALIDATION RESULTS SINGLE.

#### 6.2.2.1.9 Next Automatic Validation

“System → Control → Validation  
→ Advanced Validation  
→ Next Automatic Validation”

This menu shows the date and time for the next validation, that will be carried out automatically.



*This menu is only available if “Valves” in SETUP - INSTALLED OPTIONS is set to a value other than none.*

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.

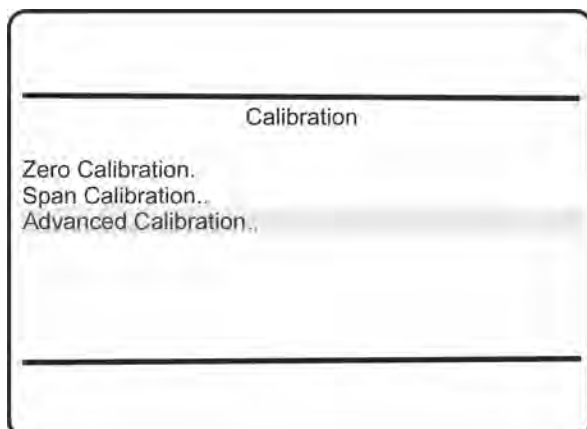
Next Automatic Validations	
Zero All	--
Zero & Span All	1/10/20 14:30

- “Zero All”: Information about when the next automatic zero validation is to be performed.
- “Zero & Span All”: Information about when the next automatic zero and span validations are to be performed.

## 6.2.2.2 Calibration Menu

“System → Control → Calibration”

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



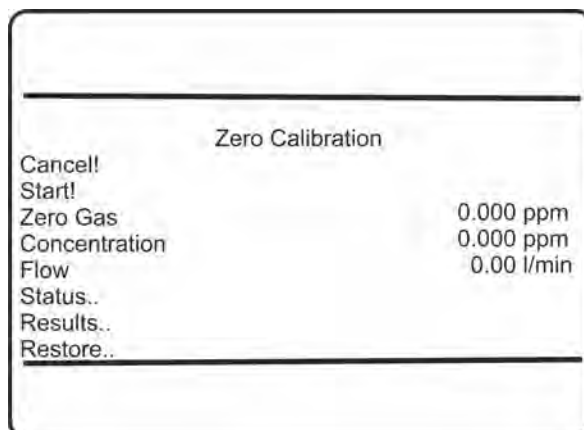
- “Zero Calibration”: Open a submenu to perform a zero calibration.
- “Span Calibration”: Open a submenu to perform a span calibration.
- “Advanced Calibration.” Optional: Open the submenu ADVANCED CALIBRATION to perform an advanced calibration.

## 6.2.2.3 Zero Calibration Menu

“System → Control → Calibration → Zero Calibration”

This menu allows to start and control a calibration procedure for the zero gas.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- “Cancel!”: Press ENTER to cancel any ongoing calibration.
- “Start!”: Press ENTER to start a zero calibration.
- “Zero Gas”: Nominal zero gas concentration can be set in SETUP.
- “Concentration”: The current measured gas concentration.
- “Flow”: The current measured gas flow.
- “Status”: Open the submenu STATUS to see calibration status information.
- “Results”: Open the submenu RESULTS to see calibration results information.
- “Restore”: Press ENTER to restore calibration data to the last known good data set. A confirmation screen appears, before the function is executed.

## 6.2.2.4 Span Calibration Menu

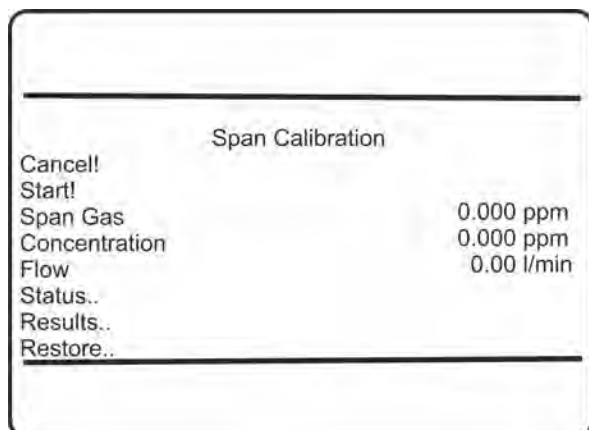
“System → Control → Calibration → Span Calibration”

This menu allows to start and control a calibration procedure for the span gas.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.







- **“Cancel!”**: Press ENTER to cancel any ongoing calibration.
- **“Start!”**: Press ENTER to start a span calibration.
- **“Span Gas”**: Nominal span gas concentration can be set in SETUP.
- **“Concentration”**: The current measured gas concentration.
- **“Flow”**: The current measured gas flow.
- **“Status”**: Open the submenu STATUS to see calibration status information.
- **“Results”**: Open the submenu RESULTS to see calibration results information.
- **“Restore”**: Press ENTER to restore calibration data to the last known good data set. A confirmation screen appears, before the function is executed.

## 6.2.2.5 Advanced Calibration Menu

“System → Control → Calibration  
→ Advanced Calibration”



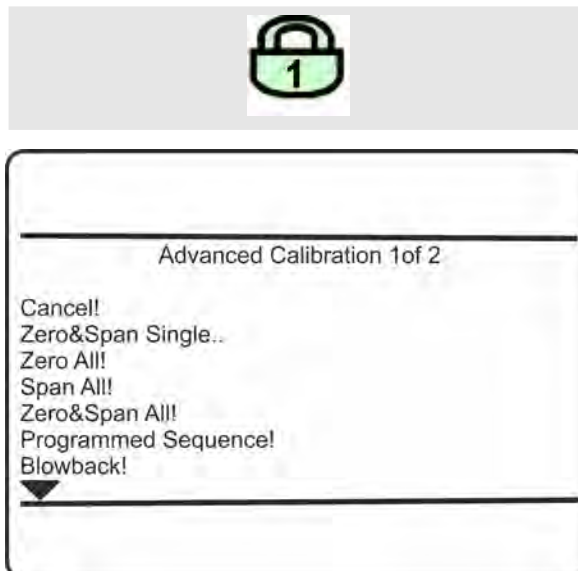
*The Analyzer offers single channel operation only. Therefore, functionality of single channel advanced calibration and all channel calibration is identical.*

his menu enables the start and control of valve supported calibration procedures.

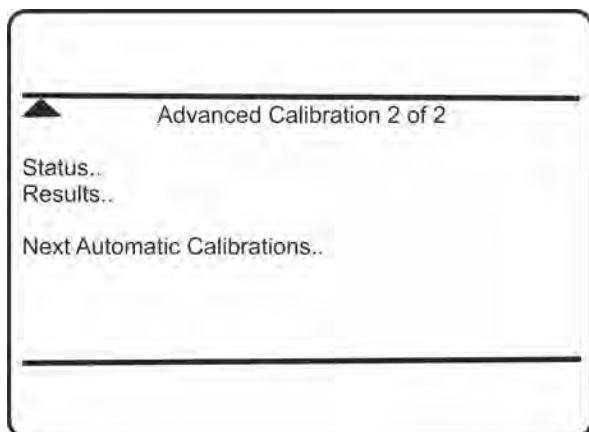


*This menu is only available if “Valves” in SETUP - INSTALLED OPTIONS is set to a value other than none.*

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **“Cancel!”**: Press ENTER to cancel any ongoing calibration.
- **“Zero & Span Single”**: Zero & span a single channel (↪ Chapter 6.2.2.5.1 “Zero & Span Single Menu” on page 87)
- Highlight any of the next three lines and press ENTER to start the related calibration procedure:
  - zero calibration
  - span calibration
  - zero and span calibration
- **“Programmed Sequence!”**: Press ENTER to start a programmed calibration sequence (↪ Chapter 6.2.3.2.8 “Set up Calibration and Validation Program Sequence” on page 108).
- **“Blowback!”**: Press ENTER to start a blow-back procedure.



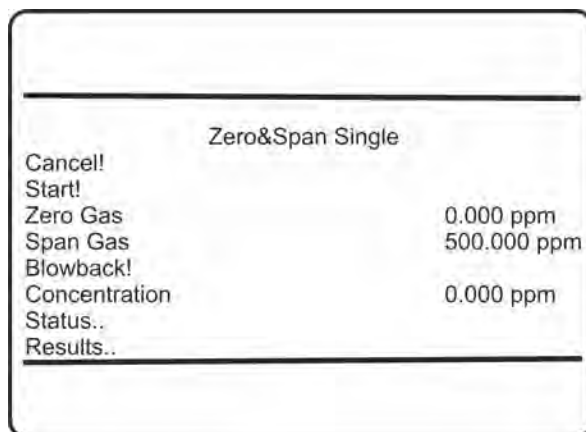
- **"Status"**: Open the submenu STATUS to see calibration status summary for all channels (↪ Chapter 6.2.2.5.2 "Calibration Status Summary" on page 87).
- **"Results"**: Open the submenu RESULTS to see calibration results summary for all channels (↪ Chapter 6.2.2.5.4 "Calibration Results" on page 88).
- **"Next Automatic Calibrations"**: Open the submenu NEXT AUTOMATIC CALIBRATIONS to view the scheduled dates for next automatically performed calibrations (↪ Chapter 6.2.4.6.8 "Next Automatic Calibrations Menu" on page 156).

## 6.2.2.5.1 Zero & Span Single Menu

"System → Control → Calibration  
→ Advanced Calibration → Zero & Span Single"

This menu enables the start and control of a valve supported calibration procedure for zero and span.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **"Cancel!"**: Press ENTER to cancel any ongoing calibration.
- **"Start!"**: Press ENTER to start a zero & span calibration procedure.
- **"Zero Gas"**: Nominal zero gas concentration can be set in SETUP.
- **"Span Gas"**: Nominal span gas concentration can be set in SETUP.
- **"Blowback!"**: Immediately start a blowback procedure.
- **"Concentration"**: The current measured gas concentration.
- **"Status"**: Open the submenu STATUS to see calibration status summary.
- **"Results"**: Open the submenu RESULTS to see calibration results summary.

## 6.2.2.5.2 Calibration Status Summary

"System → Control → Calibration  
→ Advanced Calibration → Status"

This menu gives an overview on the ongoing calibration procedure.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Calibration Status Summary	
Calibration Status Single..	Ready
Current Action	Off
Action Detail	0 s
Current Duration	0 s
Prev. Duration	0
Current Step	

- **“Calibration Status Single”**: Open the sub-menu CALIBRATION STATUS SINGLE to see detailed calibration status information.
- **“Current Action”**: The current ongoing procedure (Purging, Zeroing, Spanning, Ready).
- **“Action Detail”**: The current procedure, or Off.
- **“Current Duration”**: Remaining time for the current procedure.
- **“Prev. Duration”**: Time for the previous procedure.
- **“Current Step”**: Information about the step currently being carried out.

## 6.2.2.5.3 Calibration Status Single

“System → Control → Calibration  
→ Advanced Calibration → Status  
→ Calibration Status Single”

This menu gives a status overview.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Calibration Status Single	
Cancel!	Ready
CalibrStatus	0 s
Remaining Time	000.000 ppm
Concentration	000.000 ppm
Zero Gas	5000.000 ppm
Span Gas	Range 1
Current Range	Sample gas
Applied Gas	

- **“Cancel!”**: Press ENTER to cancel any ongoing calibration.
- **“CalibrStatus”**: Indicates the current ongoing procedure (Purging, Zeroing, Spanning, Ready).
- **“Remaining Time”**: Shows the remaining time for the current procedure.
- **“Concentration”**: The current measured gas concentration.
- **“Zero Gas”** and **“Span Gas”**: The current channel's calibration gases setup.
- **“Current Range”**: Range under calibration.

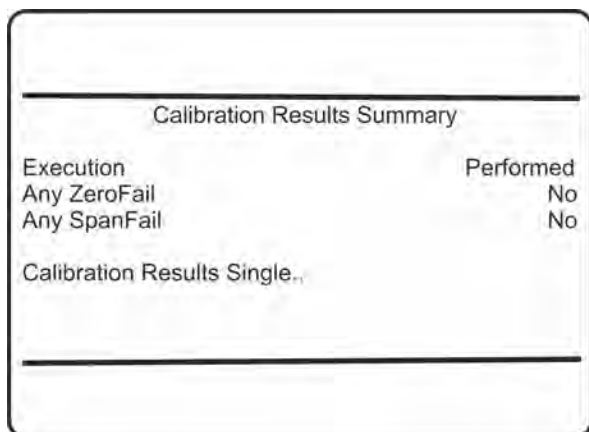
## 6.2.2.5.4 Calibration Results

“System → Control → Calibration  
→ Advanced Calibration → Results”

This menu gives an overall calibration results summary.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.





- **“Calibration Results Single”**: Open the submenu CALIBRATION RESULTS SINGLE to see detailed calibration results information.

## 6.2.2.6 Calibration Results Single

*“System → Control → Calibration  
→ Advanced Calibration → Results  
→ Calibration Results Single”*

This menu gives a summary of results.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **“Zero Result”**: Result type of last zero calibration (Success, Canceled, Timeout, Limit Exceeded, Bad Stability, OutOfLinRange, Not Allowed, Awaiting SpanCal, Sampling Fail).
- **“Zero Date”**: Date of last zero calibration.

- **“Span Result”**: Result type of last span calibration (Success, Canceled, Timeout, Limit Exceeded, Bad Stability, OutOfLinRange, Undefined Spangas, Awaiting SpanCal, Not Allowed, Sampling Fail).
- **“Span Date”**: Date of last span calibration.
- **“CalibrRanges”**: None, 1, 2, 3, 4, 1+2, 1+3, 1+4, 2+3, 2+4, 3+4, 1+2+3, 1+2+4, 1+3+4, 2+3+4, 1+2+3+4
- **“Deviations”**: Open the submenu DEVIATIONS to view calibration result deviations information.

## 6.2.2.6.1 Calibration Deviations

*“System → Control → Calibration  
→ Advanced Calibration → Results  
→ Calibration Results Single → Deviations”*

This menu gives a summary of deviations of calibration results.



*This menu is a submenu of CALIBRATION RESULTS SINGLE, which can be opened from several higher-level menu.*

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



### Example:

The CLD shows zero drift of 10 ppm per week. It is calibrated once a week. After the third zero calibration, DEVIATIONS shows:

ZeroDev: 10 ppm (=last calibr.)

ZeroDevSum: 30 ppm (=summary of three calibrations carried out within three weeks)

In the context of this menu, deviation means the value a calibration corrected the zero or respectively the span calibration value.

Deviations		
ZeroDev		0.0 ppm
ZeroDevSum		0.0 ppm
AfterZeroConc		0.0 ppm
SpanDev		0.0 ppm
SpanDevSum		0.0 ppm
AfterSpanConc		0.0 ppm

“ZeroDev.” or “SpanDev.” in concentration units, give the correction of the last corresponding calibration.

A short time after the calibration procedure has been performed, the calibration quality is tested. “AfterZeroConc” and “AfterSpanConc” show the deviations from the nominal value.

“ZeroDevSum” or “SpanDevSum” in concentration units give the total (sum of) corrections of the corresponding calibrations since the last time deviations had been reset (SETUP - CALIBRATION/VALIDATION - DEVIATIONS (Chapter 6.2.3.2.11 “Set up Calibration and Validation Deviations” on page 111)).

#### 6.2.2.7 Apply Gas Menu

“System → Control → Apply gas”

If the analyzer is connected to external valves, this menu allows to apply a specific gas to the analyzer, e.g. for maintenance purposes.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



Apply gas		
Applied Gas:		SampleGas
Flow		1.00 l/min
Concentration		25.000 ppm

■ “Applied Gas”: Select the gas to be applied.

Available options:

- Sample Gas
- ZeroGas
- SpanGas1
- SpanGas2
- SpanGas3
- SpanGas4
- Blowback
- All Closed

■ “Flow”: The current gas flow.

■ “Concentration”: The current measured gas concentration.

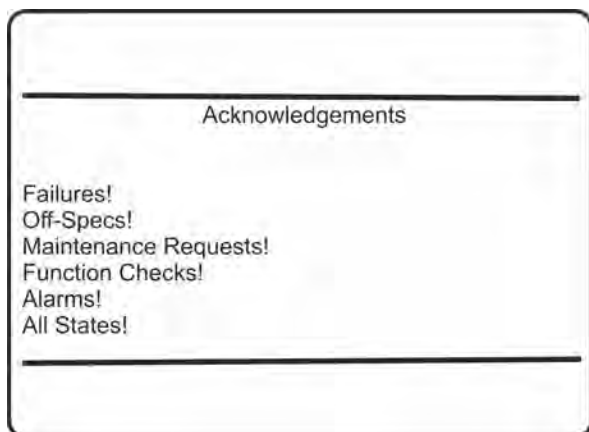
#### 6.2.2.8 Acknowledgements Menu

“System → Control → Acknowledgements”

This submenu provides function lines either to acknowledge status messages and alarms, separately (lines 1 to 5) or simultaneously (last line).

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.





- To acknowledge status messages, highlight the relevant line and press ENTER.



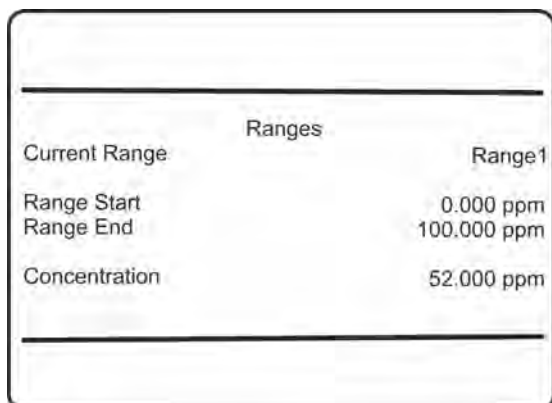
*Some failures can cause a safety switch-off of heaters and valves. Make sure the underlying problem is solved and acknowledge the alert to bring the device back to normal operation.*

## 6.2.2.9 Ranges Menu

*“System → Control → Ranges”*

This menu allows to check the measuring range.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- *“Current Range”*: Select the measuring range to be used.

Available options:

- Range1
- Range2
- Range3
- Range4

- *“Range Start”* and *“Range End”*: Show the corresponding range limits.

- *“Concentration”*: Shows the current measured value.



*To change range limits see ↗ Chapter 6.2.3.3.1 “Set up Measurement Ranges” on page 112.*

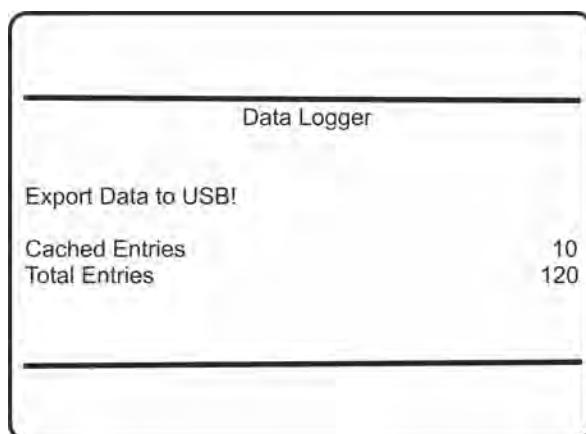
## 6.2.2.10 Data Logger

*“System → Control → Data Logger”*

This menu enables data logger data to be exported to an external device for further processing.



If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- Export logged data (=total entries) to a USB device.





*Make sure, there's a memory device connected! Before the data is exported, all "Cached entries" are copied to the "Total entries" file.*

- **"Cached Entries"**: Number of entries currently in RAM, not yet saved to the internal data logger (total entries) file.



*Data is written to the internal file every 30 min, or the moment "Logging" is turned Off (SETUP - DATA LOGGER).*

- **"Total Entries"**: Total number of entries in the internal data logger file.

## 6.2.2.11 Event/Calibration Logger

**"System → Control → Event/Calibration Logger"**

This menu allows to export event, calibration logger data and validation logger data as well to an external device for further processing.



*This menu is available only, if an optional software features license code has been purchased and installed (🔗 Chapter 6.2.3.7.1 "Set up Installed Options Licenses" on page 137).*

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **"Export Event Data to USB!"**: Export logged event data to a USB device.



*Make sure, there's a memory device connected!*

- **"Total Entries"**: Total number of entries in the internal event logger file.
- **"Export Calib Data to USB!"**: Export logged calibration data to a USB device.



*Make sure, there's a memory device connected!*

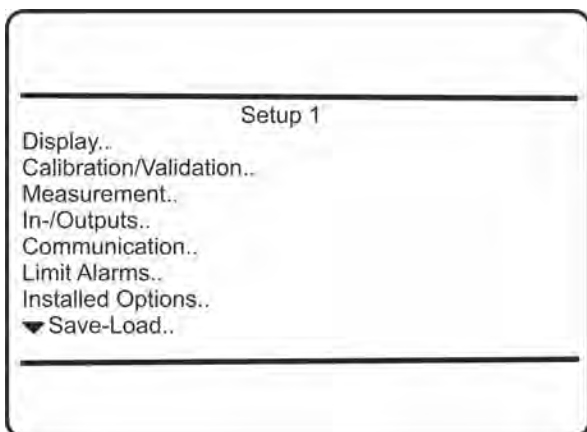
- **"Total Entries"**: Total number of entries in the internal calibration logger file. The calibration logger file includes calibration and validation entries.








## 6.2.3 Setup Menu

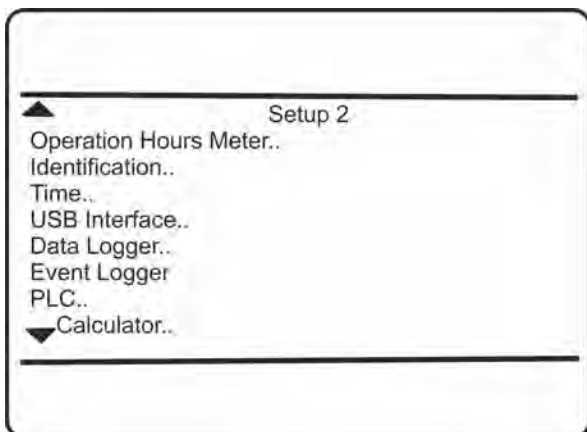
**"System → Setup"**







"This menu enables the basic analyzer settings to be changed."





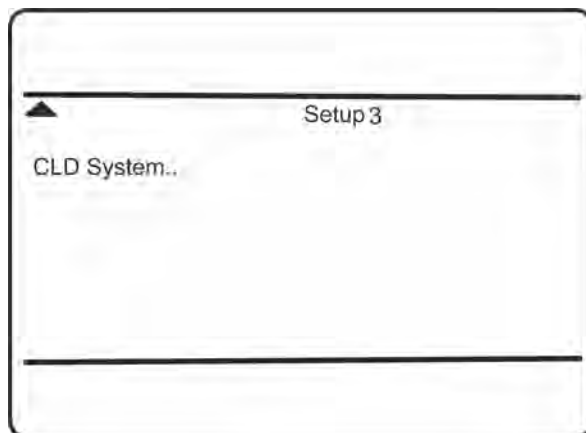


- **“Display”**: Set up display layout, language and more. 
- **“Calibration/Validation”**: Set up calibration and validation parameters. 
- **“Measurement”**: Set up channel specific parameters. 
- **“In/Outputs”**: Configure In- and Outputs. 
- **“Communication”**: Set up communication parameters. 
- **“Limit Alarms”**: Configure concentration alarms.
- **“Installed Options”**: Configure installed options and enter licence codes for software options. 
- **“Save-Load”**: Backup and restore analyzer configurations. 



- **“Operation Hours Meter”**: Operation hours meter. 
- **“Identification”**: System identification. 
- **“Time”**: Set up date/time. 
- **“USB Interface”**: USB interface setup. 
- **“Data Logger”**: Data logger setup (optional). 
- **“Event Logger”**: Event logger setup (optional). 

- **“PLC”**: PLC setup (optional). 
- **“Calculator”**: Calculator setup (optional). 



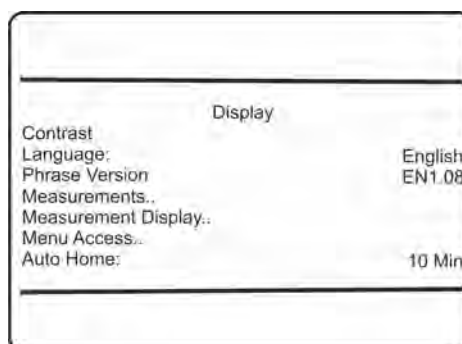
- **“CLD System”**: Specific CLD related configuration.




## 6.2.3.1 Display Setup Menu

**“System → Setup → Display”**

From within this menu you can set up how measuring results show up, control menu access, and more.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



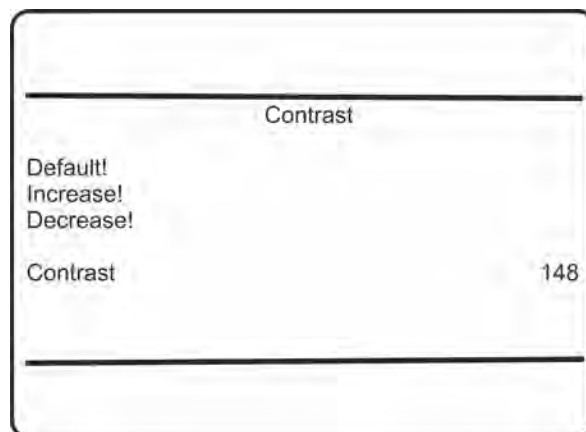
- **“Contrast”**: Adjust the display’s contrast.
  - **“Language”**: Selects the preferred language for the analyzer software. Available options vary according to the analyzer configuration. Currently available:
    - English
    - French
    - German
    - Italian
    - Polish
    - Portuguese
    - Spanish
  - **“Phrase Version”**: Phrases file version.
  - **“Measurements”**: Configure how measurement results are displayed.
  - **“Measurement Display”**: Set up the measurement display. 
  - **“Menu Access”**: Configure menu access authorizations. 
  - **“Auto Home”**: This parameter determines the time period without user activity, before returning to the measurement display from any submenu. 
- Available options:
- Never
  - 1 min
  - 10 min

## 6.2.3.1.1 Display Contrast Setup Menu

“System → Setup → Display → Contrast”

This menu allows to set up the contrast of the display.

If the system is set up correctly, the access code for Level 1 must be entered to gain access to this menu.



- **“Default!”**: Press ENTER to reset to the default value.
- **“Increase!”** and **“Decrease!”**: Increase/decrease contrast by a value of three, each time enter is pressed in either of these lines. Limits: 82 ... 208
- **“Contrast”**: Shows the currently used contrast value and is updated each time ENTER is pressed in one of the above menu lines.



*If by mistake characters are not visible any longer, reset the contrast to the default value. The display’s contrast is temperature dependent. If needed, re-adjust. The default value gives an acceptable result for the analyzer’s permitted operating temperature range.*

## 6.2.3.1.2 Display Measurements Setup Menu

“System → Setup → Display → Measurements”

This menu allows to setup measurement tags, units, precision and more for primary and secondary measurements. This specifies how the measured values are displayed.

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



Measurement
Component..
Temperature Sensors..
Pressure Sensors..
Flow Sensors..

Configure the parameters for:

- **"Component"**: Gas measurement.
- **"Temperature"**: Temperature measurement (optional).
- **"Pressure"**: Pressure measurement (optional).
- **"Flow"**: Flow measurement (optional).



*Temperature, pressure and flow are referred to as "secondary measurements".*

### 6.2.3.1.3 Display Component Setup Menu

**"System → Setup → Display → Measurements → Component"**

This menu enables the specification of how the measured gas concentration values are displayed.

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



Component	
Unit..	0.123
Precision:	NOx
Gas Name:	Ch1-R1
Range Tag	10.000 ppm
Concentration	

- **"Unit"**: Configure the measuring unit of the component.
- **"Precision"**: Configure the precision of the displayed measurements.  
Selectable options:
  - 0.
  - 0.1
  - 0.12
  - 0.123
  - 0.1234
 (this means that the fraction part can be setup between zero and four digits).
- **"Gas Name"**: Specify the gas name to show up on the measurement display.  
Maximum length: 12 characters.
- **"Range Tag"**: Shows the current range tag.
- **"Concentration"**: The last line shows the current settings for the component, depending on the settings above, and is updated if settings are changed.


♥	
Ch1-R1 Ch1	0.0 PPM NOx
Sample Pressure	255 hPa
Ozone Flow	0.7 l/min
Converter Temp	231.5 °C

Fig. 54: Measurement display elements

#### 6.2.3.1.4 Component Unit Setup Menu

"System → Setup → Display → Measurements  
→ Component → Unit"

This menu enables the configuration of the component's unit used for measurement results.



Ch1	
Component Unit	
Unit:	ppm
Unit Text:	ppm
Span Gas Unit:	ppm
Span Unit Text:	ppm
Custom Factor:	1.000000
Custom Offset:	0.000000
Span Gas	50000.000 ppm
Concentration	0.000 ppm

- **"Unit"**: Select the measuring unit for the component.  
Available options:
  - ppm
  - ppb
  - Vol%
  - Custom
- **"Unit Text"**: Set the text for the measuring unit of the component, to be shown in the measuring screen: each character must be set separately.<sup>1)</sup>
- **"Span Gas Unit"**: Select the measuring unit for the span gas.  
Available options:
  - ppm
  - ppb
  - Vol%
  - Custom



Zero gas unit and zero gas unit text are always as configured for the component (first two menu lines).



All changes on span gas unit, text, custom factor or custom offset are only taken for the current measurement mode (NO or NO<sub>x</sub>). For a global configuration of gases for NO and NO<sub>x</sub> mode and all ranges, go to Chapter 6.2.3.2.1 "Set up Calibration and Validation Gases" on page 103.

- **"Span Unit Text"**: Set the text for the measuring unit of the span gas: each character must be set separately.<sup>1)</sup>
- **"Custom Factor"**: Gas concentrations are internally calculated as ppm.  
To use other units, the corresponding factor must always be specified, e.g. 0.0001 to calculate from ppm to %.<sup>2)</sup>
- **"Custom Offset"**: If necessary, enter an offset here, to be added to the measured value.<sup>2)</sup>
- **"Span Gas" and "Concentration"**: Show how the settings affect the display of measurements.



Texts for units, and values for "Custom Factor" and "Custom Offset" are not checked for plausibility. Any arbitrary value can be set.

- 1) Configuring individual text strings is permitted only if "Unit" or "Span gas unit" is set to Custom.
- 2) "Custom factor" and "Custom offset" are visible and editable only if "Unit" or "Span gas unit" is set to Custom. For all other options, conversion factors and offsets are pre-defined.

#### 6.2.3.1.5 Display Temperature Setup Menu

"System → Setup → Display → Measurements  
→ Temperature"

This menu allows to set up the unit of the temperature.



Temperature Unit

Unit:

°C

Precision:

0.1

XSP-T1

30.0 °C

- **"Unit"**: Select the temperature unit to be used for all measurements.  
Available options:
  - °C
  - °F
  - K
- **"Precision"**: Configure the precision of temperature displays  
Accepted values: 0., 0.1, 0.12
  - 0.
  - 0.1
  - 0.12
- **"XSP-T1"**: Example for the current settings.



Conversion factors for the different units are pre-defined.

## 6.2.3.1.6 Display Pressure Setup Menu

**"System → Setup → Display → Measurements → Pressure"**

This menu allows to set up the unit of the pressure.



Pressure Unit

Unit:

hPa

Precision:

0.

XSP-P1

1013 hPa

- **"Unit"**: Select the pressure unit to be used for all measurements.  
Available options:
  - hPa
  - mbar
  - bar
  - psig
  - Pa
- **"Precision"**: Configure the precision of pressure displays  
Accepted values:
  - 0.
  - 0.1
  - 0.12
- **"XCP-P1"**: Example for the current settings.



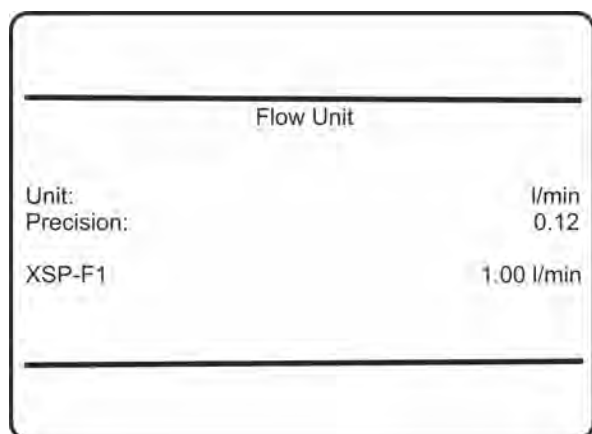
Conversion factors for the different units are pre-defined.

## 6.2.3.1.7 Display Flow Setup Menu

**"System → Setup → Display → Measurements → Flow"**

This menu allows to set up the unit of the flow.





- **“Unit”**: Select the flow unit to be used for all measurements.

Available options:

- l/min
- l/h
- ml/min,
- gal/min



$1 \text{ gal} = 1 \text{ US.liq.gal.} = 3.7853 \text{ l}$

- **“Precision”**: Configure the precision of flow displays.

Accepted values:

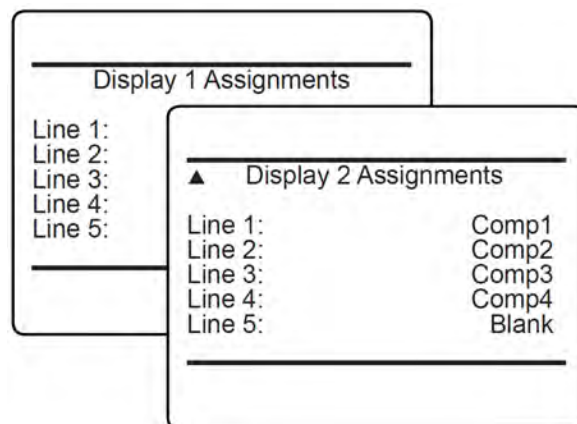
- 0.
- 0.1
- 0.12

- **“XSP-F1”**: Example for the current settings.



Conversion factors for the different units are pre-defined.

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



The MEASUREMENT DISPLAY may be configured as a single or dual page version, where the content of each page can be configured separately by a related page within this setup menu.

The first setup menu page (Display 1 Assignments) configures the first MEASUREMENT DISPLAY page. Up to five measurements may be set up to be displayed on the page.

The display adjusts the layout to the number of configured lines.

Enter the second menu page (Display 2 Assignments) to set up a second MEASUREMENT DISPLAY page.



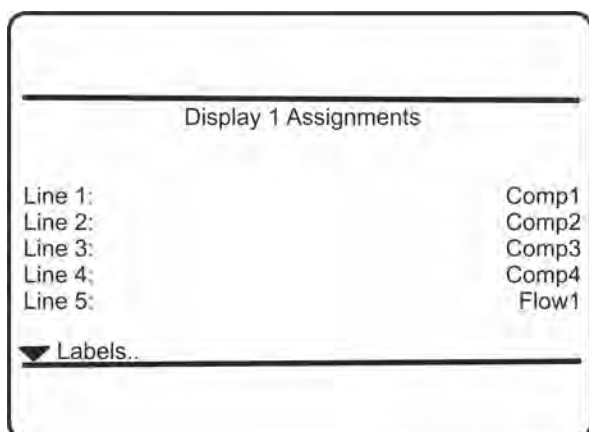
*The primary measurement is the measured gas concentration. Secondary measurements are pressure, flow, temperature; these are always displayed smaller.*

## 6.2.3.1.8 Measurement Display Setup Menu

“System → Setup → Display  
→ Measurement Display”

This menu allows to configure the measurement display.





- **“Line 1 – Line 5”:** On either setup menu page, highlight the line to be configured, press ENTER and then select the parameter to be displayed in the related line by means of up/down.

Available options:

- Comp1
- Temp1
- Flow1
- Press1
- CalcA ... CalcD
- CLD-Samp-P
- CLD-O3-F
- CLD-Conv-T
- CLD-Mfld-T
- CLD-Elect-T
- Blank

- **“Labels”:** Configure the labels (see below).



### 6.2.3.1.9 Set up Measurement Display Labels

*“System → Setup → Display → Measurement Display → Labels”*

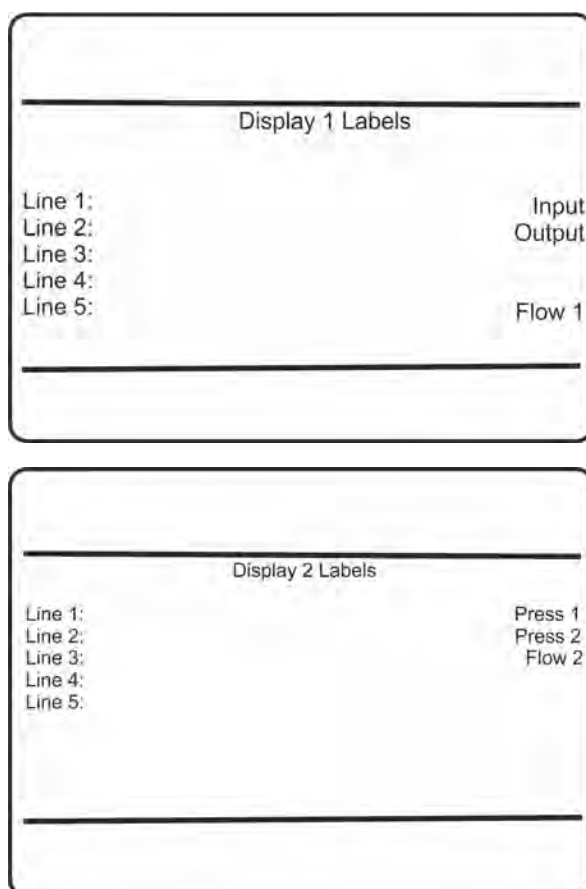
For each MEASUREMENT DISPLAY line you may enter an individual text, called *“Label”*.

Specifications:

- free alphanumeric text
- maximum length: eight characters

Labels:

- show up on the MEASUREMENT DISPLAY only,
- may be set up for primary and secondary measurements, as they refer to the MEASUREMENT DISPLAY line, and not to the parameter.



**Display 1 Labels**

Line	Label
Line 1:	Input
Line 2:	Output
Line 3:	
Line 4:	
Line 5:	Flow 1

**Display 2 Labels**

Line	Label
Line 1:	Press 1
Line 2:	Press 2
Line 3:	
Line 4:	
Line 5:	Flow 2

*“Display 1 Labels/Display 2 Labels”*: Within this menu, to configure a label, enter the related menu line and enter the text.



*There are separate DISPLAY LABELS menus for each MEASUREMENT DISPLAY.*

Differing from labels, tags are used to identify a measurement (primary or secondary), and for this reason:

- are transmitted via network
- show up on menu headlines with channel related data
- show up on the MEASUREMENT DISPLAY also.

Due to their importance for measurement identification within a network, the menu to set up tags can be found at SETUP - IDENTIFICATION (🔗 *Chapter 6.2.3.11 "Set up Identification" on page 144*).

## Examples:

MEASUREMENT DISPLAY, if besides gas names and units, only labels are set up:

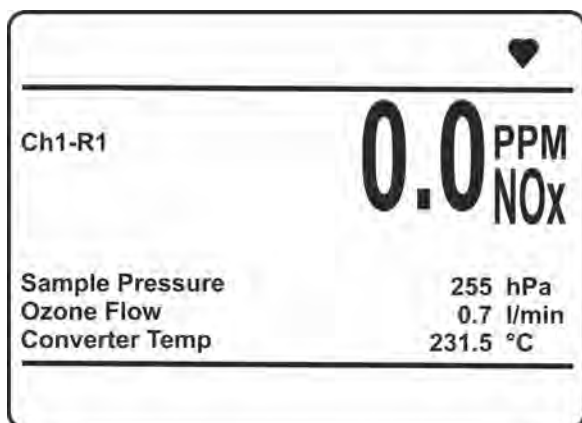
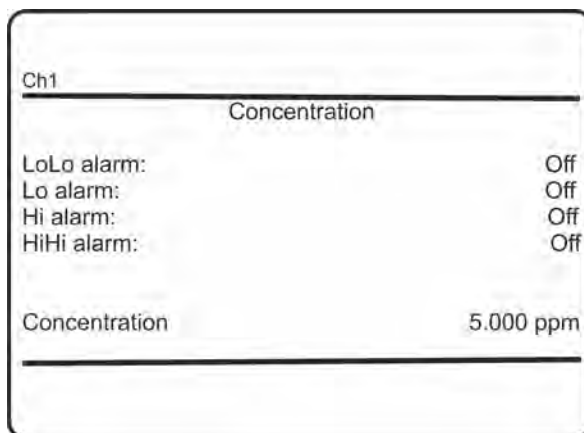
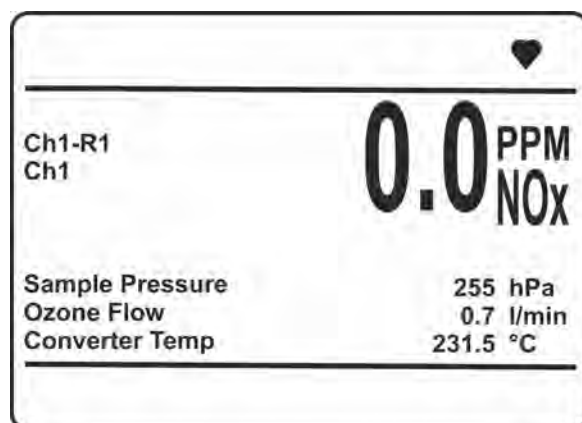


Fig. 55: Main Screen (example)

Identification of component specific menu pages:



MEASUREMENT DISPLAY, if tags are set up also.



To configure gas names and units: SETUP - DISPLAY - MEASUREMENTS, see [Chapter 6.2.3.1.3 “Display Component Setup Menu” on page 95](#).

Identification of components in log files:

# EMERSON	X-STREAM XE	Data Logs		
# Tag:	-- The Device Tag --			
# Serial:	SN4294909952			
# -----	-----			
Date	Time	Ch1:Conce[ppm]	Status	
10/22/2009	10:20:36	933	G	
10/22/2009	10:20:37	934	G	
10/22/2009	10:20:38	936	G	

Tag

## 6.2.3.1.10 Menu Access Setup

“System → Setup → Display → Menu Access”

This menu enables to configure access level codes.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



Menu access

Restrict Level1:	Off
Code Level1:	00000001
Restrict Level2:	Off
Code Level2:	00000002
Restrict Level3:	Off
Code Level3:	00000003
Activate:	On Home

### ! NOTICE!

When using access codes, we recommend NOT using the factory-set codes.

- **“Restrict Level1 – Restrict Level3”:** Enter these lines to activate or de-activate the access restrictions for the related menu level.  
Available options:
  - On
  - Off
- **“Code Level1 – Code Level3”** Set up the access codes: Up to eight alphanumeric characters may be entered for each code.
- **“Activate”:** Determines how unlocked menus are relocked to restore security settings.  
Available options:
  - **On Home:** all levels with an active access code are locked on return to the MEASUREMENT DISPLAY.
  - **1 min:** Levels are locked after one minute of inactivity.
  - **Never:** Menus remain unlocked.



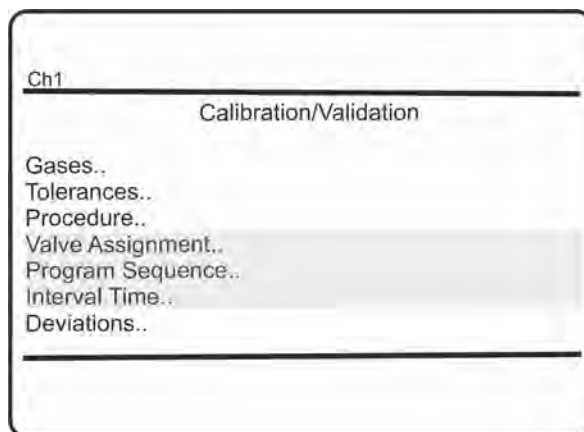
Executing “Lock menus” in CONTROL, immediately sets all activated locks.

## 6.2.3.2 Calibration and Validation Setup Menu

**“System → Setup → Calibration and Validation”**

This menu shows the specific options that must be set up for calibration and validation procedures.

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



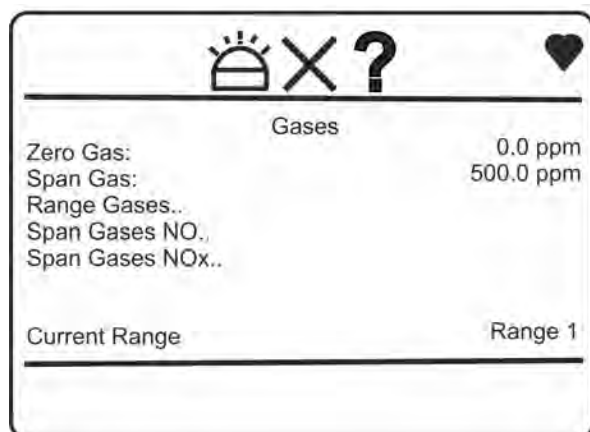
- **“Gases.”:** Submenu to specify the calibration gases.
- **“Tolerances.”:** Set up calibration tolerances.
- **“Procedure.”:** Set up details for the calibration procedure.
- **“Valve Assignment.”:** Assign calibration valves.
- **“Program Sequence.”:** Program a detailed calibration sequence (optional).
- **“Interval Time.”:** Specify interval times for automatic calibration (optional).
- **“Deviations.”:** See (and reset) calibration deviations information (optional).

### 6.2.3.2.1 Set up Calibration and Validation Gases

**“System → Setup → Calibration and Validation → Gases”**

This menu allows to set up the concentration for gases.





The first two lines only apply to the current range and the current measuring mode (NO/NO<sub>x</sub>). For a global configuration of all ranges choose RANGE GASES. For a global span gas configuration of both modes, configure SPAN GASES NO and SPAN GASES NO<sub>x</sub>.

- “Zero Gas”: Enter the line ZERO GAS to set up the zero gas concentration for the current range.
- “Span Gas”: Enter the line SPAN GAS to set up the span gas concentration for the current range and measuring mode.
- “Range Gases..”: Submenu RANGE GASES specifies different calibration and validation gases for several ranges for the current mode (if instrument is setup to use different ranges)
- “Span Gases NO..”: Submenu SPAN GASES NO specifies different NO concentrations within span gases for several ranges. This values are used when the analyzer is switched to NO-mode.
- “Span Gases NOx..”: Submenu SPAN GASES NO<sub>x</sub> specifies different NO<sub>x</sub> concentrations within span gases for several ranges. These values are used when the analyzer is switched to NO<sub>x</sub> mode.
- “Current Range”: Information about currently used range.



If the available span gas contains amounts of NO as well as NO<sub>2</sub> the span gas values are different between both measuring modes. If the span gas only contains NO as recommended, the entries in both sub-menus need to be identical.

#### Example:

The span gas for range one contains 100ppm NO as well as 20ppm NO<sub>2</sub>. If the analyzer is calibrated in NO mode, the corresponding span gas value is 100ppm NO. If the analyzer is calibrated in NO<sub>x</sub> mode, the corresponding span gas value needs to be 120ppm NO<sub>x</sub> (NO + NO<sub>2</sub>).

#### 6.2.3.2.2 Set up Span Gases NO

“System → Setup → Calibration and Validation → Gases → Span Gases NO”

This menu enables to specify separate span calibration gas concentrations for each range of the NO mode as well as a span gas unit and a unit conversion (Fig. 56).

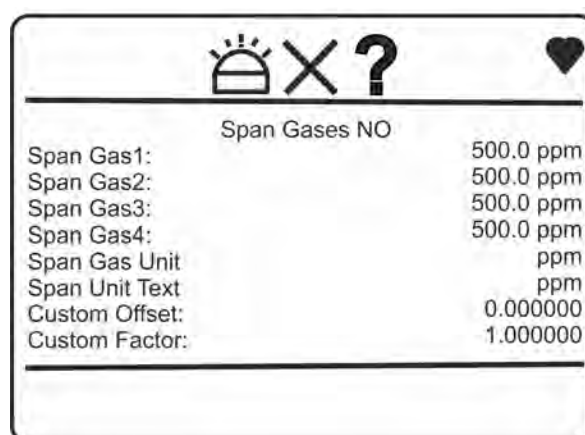


Fig. 56: Span Gases NO

## 6.2.3.2.3 Set up Span Gases NO<sub>x</sub>

“System → Setup → Calibration and Validation  
→ Gases → Span Gases NO<sub>x</sub>”

This menu enables to specify separate span calibration gas concentrations for each range of the NO<sub>x</sub> mode as well as a span gas unit and a unit conversion (Fig. 57).

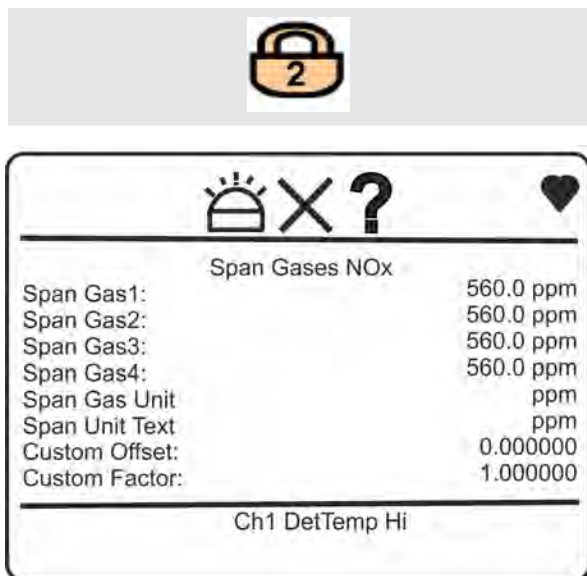
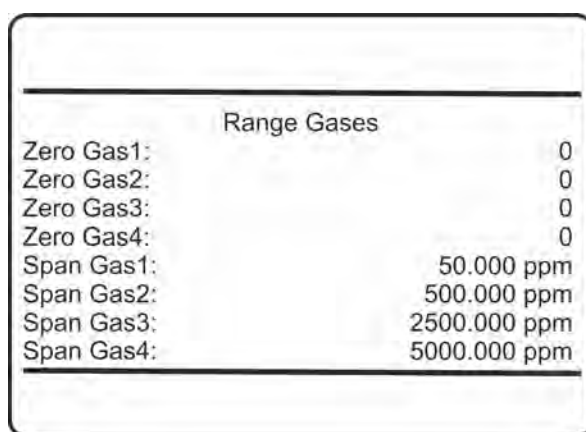


Fig. 57: Span Gases NO<sub>x</sub>

## 6.2.3.2.4 Set up Range Gases

“System → Setup → Calibration and Validation  
→ Gases → Range Gases”

This menu enables to specify separate zero and span calibration gas concentrations for each range of the activated measuring mode.

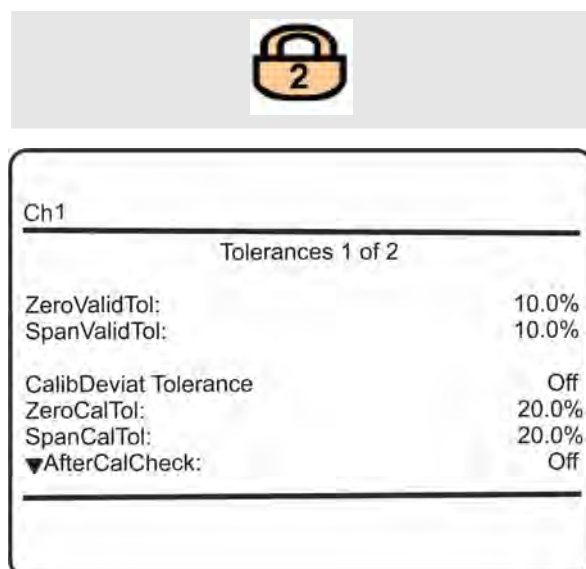


The calibration gases units are as set up in  
Chapter 6.2.3.1.4 “Component Unit  
Setup Menu” on page 96.

## 6.2.3.2.5 Set up Calibration and Validation Tolerances

“System → Setup → Calibration and Validation  
→ Tolerances”

During the validation procedure, it is checked, if the current concentration signal is within +/- n % of the calibration gas value. If not, the validation is declared as failed.





- **“ZeroValidTol” and “SpanValidTol”**: Set up the validation limits for zero and span gas individually.  
Accepted values: 0 ... 100 %  
(of the channel's full range resp. span gas value).
- **“CalibDeviat Tolerance”**: This parameter determines whether the tolerance check is active during calibration (On), or not (Off).
- **“ZeroCalTol” and “SpanCalTol”**: If a tolerance check is enabled (On), set up the limits for zero and span gas individually.  
Accepted values: 0 ... 100 %  
(of the channel's full range resp. span gas value)
- **“AfterCalCheck”**: If 'AfterCalCheck' is enabled (On), the calibration procedure adds an additional phase where it measures and stores the concentration value shortly after the calibration.

Ch1	
Tolerances 2 of 2	
ZeroTolRef:	2000.0 ppm
ZeroValidTol+-	200.0 ppm
ZeroCalTol+-	400.0 ppm
SpanTolRef:	2000.0 ppm
SpanValidTol+-	200.0 ppm
SpanCalTol+-:	400.0 ppm

This menu shows the explicit concentration reference and limit values for the calibration and validation procedures for zero and span gas. They are calculated using the configured zero respective span gas values and their according percentage tolerance.

## 6.2.3.2.6 Set up Calibration and Validation Procedure

“System → Setup → Calibration and Validation → Procedure”

This menu allows a detailed configuration of the calibration and validation procedures.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



Ch1	
Procedure	
CalProcMode:	AdvCal
Purge Time:	10 s
Time Max:	120 s
Zero Ranges:	Together
Span Ranges	Separately
Zero Method:	Stability
Span Method:	Instant
Test Mode:	No

This menu line enables to select how the current channel is to be considered for calibration.

Available options for **“CalProcMode”**:

- **AdvCal**: This channel is permitted to be included into advanced calibration procedures. This requires valves to be assigned.
- **SingleAuto**: This channel is permitted to be calibrated by a single zero or span calibration only. This requires valves to be assigned.
- **Manual**: This channel is only permitted to be manually calibrated.
- **Disabled**: This channel is not allowed to be calibrated.



Marked lines are available only if “Valves” in **INSTALLED OPTIONS** is set to a value other than none.



**AdvCal** also enables **SingleAuto** and **Manual** calibrations.

**SingleAuto** also enables **Manual** calibrations.



Ch1	
Procedure	
CalProcMode:	AdvCal
Purge Time:	10 s
Time Max:	120 s
Zero Ranges:	Together
Span Ranges:	Separately
Zero Method:	Stability
Span Method:	Instant
Test Mode:	No



Marked lines are available only if "Valves" in INSTALLED OPTIONS is set to a value other than none.

"CalProcMode" does not influence any validation. Validations are always possible, irrespective of the selection under "CalProc- Mode".

- **"Purge Time"**: The time required to completely fill the gas line with the related gas, when switching to zero or span gas. Adjust according your system.  
Accepted values: 0 ... [max. time, see next menu line]
- **"Max. Time"**: The maximum time to complete a calibration/validation procedure, if calibrated/validated using the stability method. If not already regularly finished, a calibration/validation will be terminated after this time.  
Accepted values: 0 ... 600 seconds.
- **"Zero Ranges" and "Span Ranges"**: Specify how to calibrate/validate multiple ranges.  
Available options: Together, Separately.
- **"Zero Method" and "Span Method"**: Specify the calibration/validation methods for zero and span calibrations/validations.  
Available options: Stability, Instant.
- **"Test Mode"**: Set to Yes, to simply check, if the calibration/validation is still valid. In test mode the instrument performs calibration/validation procedures without correcting the calibration/validation parameters (simulation of calibrations/validations).

## 6.2.3.2.7 Set up Calibration and Validation Valves

"System → Setup → Calibration and Validation  
→ Valve Assignment"

This menu allows to configure valve assignments.



This menu is available only if "Valves" in INSTALLED OPTIONS is set to a value other than none.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.

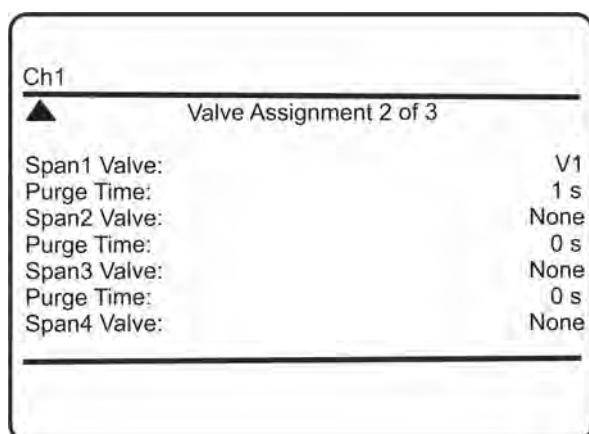


Ch1	
Valve Assignment 1 of 3	
Sample Valve:	V3
Purge Time:	10 s
Zero Valve:	V4
Purge Time:	5 s
▼ Correct Assign	Yes

- **"Sample Valve" and "Zero Valve"**: Assign valves to be used for different functions, (available options: None, V1 ... V20) and
- **"Purge Time"**: Specify the purge time for each valve (accepted values: 0 ... 10,000 s)
- **"Correct Assign"**: If there is no conflict in valve assignment, this line shows Yes, otherwise check if, e.g. one valve has been assigned different functions.



The purge time depends on the gas line design and length, and is the time it takes for the gas stream to completely fill the measuring cell, after the related valve has been opened. Take care to set the purge time correctly, otherwise the measured concentrations may be incorrect. If purge times are too short, the measuring cell is filled with improper gas.

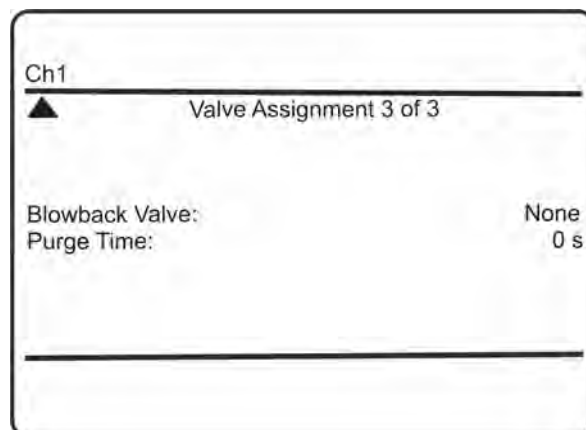


Ch1	
Valve Assignment 2 of 3	
Span1 Valve:	V1
Purge Time:	1 s
Span2 Valve:	None
Purge Time:	0 s
Span3 Valve:	None
Purge Time:	0 s
Span4 Valve:	None

- On the second menu page, assign the span valves and specify their purge times for the different ranges.



Span gas valves are not distinguished between the two measuring modes NO and NO<sub>x</sub>. Therefore, the same span gas is used for the calibration of both modes. If the span gas has different concentrations of NO and NO<sub>x</sub> set the span gas values accordingly ↗ Chapter 6.2.3.2.1 “Set up Calibration and Validation Gases” on page 103.



Ch1	
Valve Assignment 3 of 3	
Blowback Valve:	None
Purge Time:	0 s

- The third menu page enables to assign a blowback valve, and specify its purge time.

#### 6.2.3.2.8 Set up Calibration and Validation Program Sequence

“System → Setup → Calibration and Validation → Program Sequence”



This line is available only if “Valves” in INSTALLED OPTIONS is set to a value other than none.

This menu with eight pages allows to set up a sequences of up to 30 actions (steps), to carry out individual calibration or validation procedures.

Additionally, it allows to setup the time for the 'Wait' action.



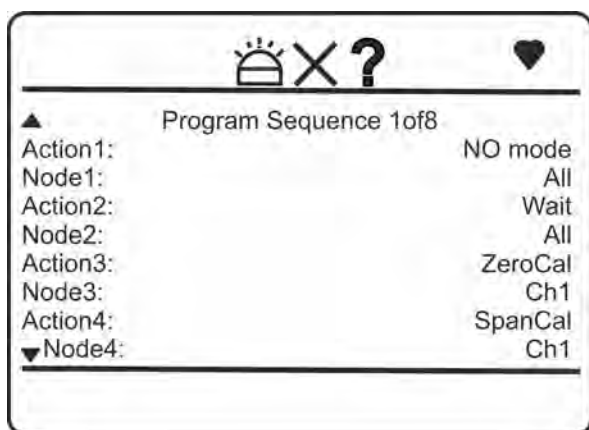


Fig. 58: Program Sequence 1 of 8

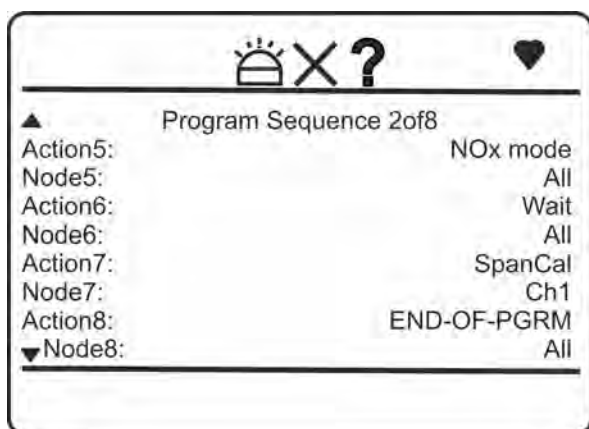
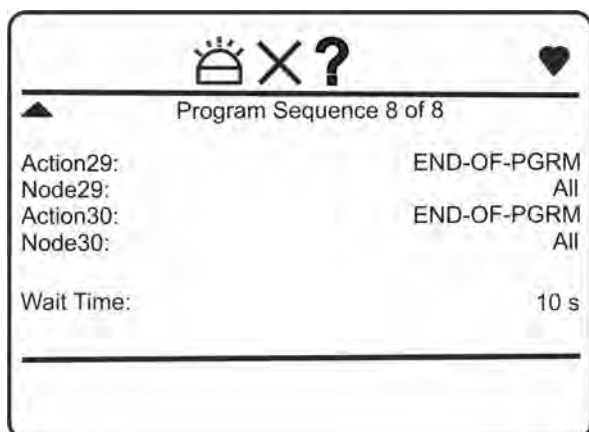


Fig. 59: Program Sequence 2 of 8



Each step consists of an action and a related node.

Available actions are:

Action name	What to happen
Rg1SpanCal ...	span calibrate range1
Rg4SpanCal	... range4
ZSpanCal	zero & span calibrate
SpanCal	span calibrate
ZeroCal	zero calibrate
NoOp	no action
ZSpanValid	zero & span validate
SpanValid	span validate
ZeroValid	zero validate
Blowback	start blowback
END-OF-PGRM	end of programmed sequence
NO mode	switch analyzer to NO mode
NOx mode	switch analyzer to NO <sub>x</sub> mode
Wait	wait for the time specified in menu "Program Sequence" on page 8

For the XECLD there is only one channel available and therefore the two options for the nodes are Ch1 and All.

## Example:

The sequence in the first figure (Fig. 58) starts with:

- switching the analyzer to NO mode
- wait for the specified time
- zero calibrate all ranges
- span calibrate all ranges

Sequence continues as shown in the second figure (Fig. 59):

- switching the analyzer to NO<sub>x</sub> mode
- wait for the specified time
- span calibrate all ranges

## 6.2.3.2.9 Set up Calibration and Validation Interval Time

"System → Setup → Calibration and Validation → Interval Times"



*This line is available only if “Valves” in INSTALLED OPTIONS is set to a value other than none.*

This menu allows to select the procedure(s) you want to configure to be carried out on a regular (interval time) basis.



Interval Times

ZeroCal All..

Zero&SpanCal All..

Programmed Sequence..

Blowback All..

ZeroValid All..

Zero&SpanValid All..



*All lines in this menu link to submenus of a similar design, as demonstrated in the following section.*

#### 6.2.3.2.10 Set up an Interval Time



*This line is available only if “Valves” in INSTALLED OPTIONS is set to a value other than none.*

Interval Times

Enable:  
 Interval:  
 Start Time..

Disabled  
 24 h

Next: --

Time

3/22/11 15:33

- “...”: Depending on the procedure selected on the previous menu page, the title shows “Zero- Cal All”, “Zero&SpanCal All”, “Programmed Sequence”, “Blowback All”, “ZeroValid All” or “Zero&SpanValid All”.
- “Enable”: Enable or Disable interval times for the selected procedure.
- “Interval”: Specify the interval between two procedures.  
Accepted values: 1 ... 10,000 h
- “Start Time”: Specify the date to start the countdown for the next interval.
- “Next”: Shows the time for the next start of procedure, based on the current settings.
- “Time”: The current time.

Start

Month:  
 Day:  
 Hour:  
 Minute:  
 Set!

6  
 23  
 10  
 0

Next

6/23/10 10:00

- "...": In "... " the title is replaced by "ZeroCal All", "Zero&SpanCal All", "Programmed Sequence", "Blowback All ", "ZeroValidAll " or "Zero&SpanValid All " depending on the selected procedure.
- "Month", "Day", "Hour" and "Minute": in lines 1 to 4, specify date and time for the next countdown to start.
- "Set": Set start date and time:  
The next calibration or validation time is calculated, considering the entries in above lines and the interval time given on the previous page.



*This procedure also updates the four lines above, to show the next calibration or validation date and start time.*

- "Next": Shows the time for the next start of procedure, based on the current settings.

## 6.2.3.2.11 Set up Calibration and Validation Deviations

"System → Setup → Calibration and Validation → Deviations"

This menu shows deviation values from nominal values and allows to reset them.



Deviations	
Calibration Deviations..	
ZeroValidDev	
ZeroValidDev Reset!	
SpanValidDev	0.0 ppm
SpanValidDev Reset!	

- "ZeroValidDev" and "SpanValidDev": Show the values in concentration units which means the amount by which they deviate from the nominal values for zero resp. span gas setup in SETUP - CALIBRATION/ VALIDATION - GASES determined by the last successful validation procedure.
- "ZeroValidDev Reset!" and "SpanValidDev Reset!": Reset all zero or span deviations.



*These functions are carried out immediately, and cannot be undone!*

## 6.2.3.2.12 Set up Calibration Deviations

"System → Setup → Calibration and Validation → Deviations → Calibration Deviations"

In the context of this menu, deviation means the value the current zero or span calibration value is corrected by subsequent calibrations.



Ch1 Calibration Deviations	
ZeroDev	0.0 ppm
ZeroDevSum	5.000 ppm
AfterZeroConc	7.000 ppm
Zero Deviation Reset!	
SpanDev	0.0 ppm
SpanDevSum	100.000 ppm
AfterSpanConc	0.0 ppm
Span Deviation Reset!	

- "ZeroDev" or "SpanDev": Gives the correction by the last performed calibration.
- "AfterZeroConc" and "AfterSpanConc": A short time after the calibration procedure has been performed, the calibration quality is tested. 'AfterZeroConc' and 'AfterSpanConc' show the deviations from the nominal value.



- “ZeroDevSum” and “SpanDevSum”: Gives the total (sum of) corrections of all the referred calibrations since the last time, deviations have been reset.
- “Span Deviation Reset!”: Reset all zero or span deviations.



*These functions are carried out immediately, and cannot be undone!*

## Example:

A measuring channel shows zero drift of 10 ppm per week. It is calibrated once a week. After three weeks of operation, DEVIATIONS would show:

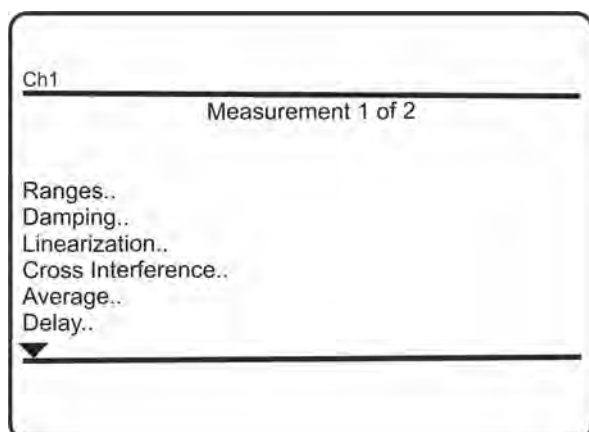
ZeroDev: 10 ppm (= last calibr.)

ZeroDev Total: 30 ppm (= summary of three calibrations, carried out within three weeks)

## 6.2.3.3 Set up Measurement

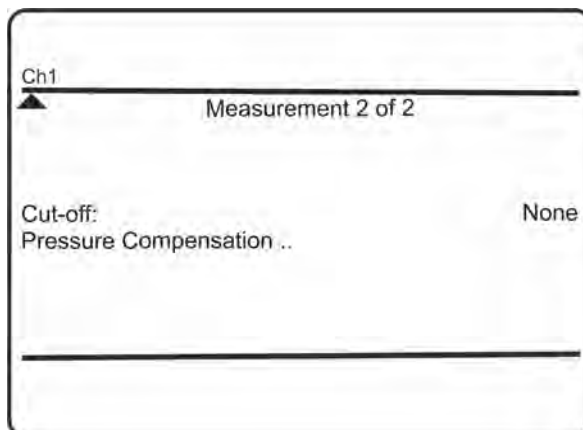
“System → Setup → Measurement”

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu and all submenus.



- “Ranges..”: Submenu to configure up to four ranges.
- “Damping..”: Set up  $t_{90}$  times.

- “Linearization..”: Set up and activate linearization.
- “Cross Interference..”: Setup and activate cross interference compensation.
- “Average..”: Set up and activate averaging.
- “Delay..”: Set up delay time.



- “Cut-off”: Output values are limited, in case they exceed the configured range limits, or are becoming negative.

Available options:

- None: cut-off mode is disabled
- RngLimits: values are limited to range limits
- NonNegat.: negative values are output as '0'.

- “Pressure Compensation”: Set up ambient pressure for compensation.



*Cut-off always is disabled during calibrations!*

## 6.2.3.3.1 Set up Measurement Ranges

“System → Setup → Measurement → Ranges”

This menu allows to configure up to four ranges.



Ch1

---

Ranges

---

Current Range: Range1  
 Range Start: 0.000 ppm  
 Range End: 50000.000 ppm  
 Starts & Ends..  
 Range Control: Manual  
 Auto Ranging..

---

- **“Current Range”**: Select the range to be configured.  
Available options:
  - Range1 ... Range4
- **“Range Start” and “Range End”**: For the current range, specify start and end concentration limits.
- **“Starts & Ends..”**: Specify the limits for up to four ranges in one single menu, making it easier.
- **“Range Control”**: For the current range, specify how range switching is done.  
Available options:
  - Manual
  - Remote
  - Automatic



Selecting Remote or Automatic range control is not possible if identical ranges end values are specified.

- **“Auto Ranging..”**: Specify the switchover levels for up to four ranges.

### 6.2.3.3.2 Measurement Ranges Starts & Ends

“System → Setup → Measurement → Ranges → Starts & Ends”

This menu allows to define a start and an end concentration for all four ranges at once.



Ch1

---

Starts & Ends

---

Range1 Start: 0.000 ppm  
 Range1 End: 500.000 ppm  
 Range2 Start: 0.000 ppm  
 Range2 End: 1000.000 ppm  
 Range3 Start: 0.000 ppm  
 Range3 End: 5000.000 ppm  
 Range4 Start: 0.000 ppm

---

- **“Range1 Start...Range4 End”**: Select the range to be configured and set start and end concentrations.



For automatic or remote range control, all ranges end values need to be different!

### 6.2.3.3.3 Measurement Autoranging

“System → Setup → Measurement → Ranges → Autoranging”

Ch1

---

Auto Ranging

---

Range1: Yes  
 Range2: Yes  
 Range3: Yes  
 Hysteresis: 10 %  
 Switchover Levels..

---

This menu allows to switch on or off the auto-ranging function for each range.






- “Range1”, “Range2” and “Range3”: For each range, select separately, if autoranging is to be used (Yes) or not (No).
- “Hysteresis”: Specify the hysteresis for autoranging.  
Accepted range: 1 ... 50 %
- “Switchover Levels”: Alternatively specify switchover limits for each range separately.

#### 6.2.3.3.4 Autoranging Switchover Levels

“System → Setup → Measurement → Ranges → Autoranging → Switchover Levels”

This menu allows to specify individual switchover levels, instead of using one single hysteresis value for all ranges.



Ch1	
Switchover Levels	
MaxLevel1:	500.000 ppm
MinLevel2:	400.000 ppm
MaxLevel2:	750.000 ppm
MinLevel3:	600.000 ppm
MaxLevel3:	2000.000 ppm
MinLevel4:	1800.000 ppm

- “MaxLevel ”: Gives the switchover limit for rising concentrations: If this level is exceeded, the analyzer activates the next higher range.
- “MinLevel”: Gives the switchover limit for decreasing concentrations: If this level is underrun, the analyzer activates the next lower range.



As given in the figure specifying the “MinLevel” of a level to be lower than the “MaxLevel” of the level right below defines a switching hysteresis.

#### 6.2.3.3.5 Set up Damping


“System → Setup → Measurement → Damping”

Any measuring system applies a damping on its output signal compared to the change of the “real” measurement and due to delays caused by:

- electronic signal processing
- sensors with finite response time
- gas flow, and more.

This damping is called “system damping”.

This menu enables to setup an additional electronic damping ( $t_{90}$  time), that is added to the system damping. The reason to do so, is to e.g. have a smoother output signal.



Ch1	
Damping	
t90 Range1:	2.0 s
t90 Range2:	2.0 s
t90 Range3:	2.0 s
t90 Range4:	2.0 s
t90 Current	2.0 s
Current Range	Ch1-R1
t90 Time Max	76.9 s

- “t90 Range1...t90 Range4”: Specify  $t_{90}$  times for each range.
- “t90 Current”: Gives the current  $t_{90}$  time, specified for the currently selected range.
- “Current Range”: Shows the current measuring range.
- “t90 Time Max”: Gives the maximum possible  $t_{90}$  time, which is limited by the size of the internal sampling buffer and the internal sampling rates.

#### 6.2.3.3.6 Set up Linearization

“System → Setup → Measurement → Linearization”

This menu allows to correct unlinear measurements behaviors by enabling a linearization algorithm.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu and all submenus.



Ch1

---

Linearization

Linearizer: Off

LinearMethod: Splines

Calculate!

Setpoints (X)..

Actuals (Y)..

Linearizer Min 20.000 ppm

Linearizer Max 110.000 ppm

▼ Status Normal

- **“Linearizer”**: Switch the linearizer On or Off.
- **“LinearMethod”**: Specify the linearization method to be used.  
Available options:
  - Splines
  - Polynom
- **“Calculate!”**: Select this line to calculate the new linearization curve.
- **“Setpoints (X)..”**: First enter SETPOINTS (X) to enter the new setpoint values.
- **“Actuals (Y)..”**: When complete, enter ACTUALS (Y) to enter the corresponding actuals.
- **“Status”**: The linearization status.  
Possible values:
  - Normal
  - Underflow
  - Overflow
  - Undefined

Ch1

---

Linearization

LinearMethod: Splines

LinearizerRange1: Off

LinearizerRange2: Off

LinearizerRange3: Off

LinearizerRange4: Off

Coefficients..

Current range: Range1

▼ Concentration 0.000 ppm

- **“LinearMethod”**: Specify the linearization method to be used.  
Available options:
  - Splines
  - Polynom
- **“LinearizerRange1...LinearizerRange4”**: Separately switch **On** or **Off** the Linearization for each range.
- **“Coefficients..”**: Submenu to enter coefficients.
- **“Current range”**: Select the current range.
- **“Concentration”**: The current measured gas concentration.

Ch1

---

Linearization

Linearizer Min 20.000 ppm


Linearizer Max 110.000 ppm

Status Normal

- **“Linearizer Min” and “Linearizer Max”**: The measuring range, covered by the linearization settings.
- **“Status”**: Linearization status.  
Possible values:
  - Normal
  - Underflow
  - Overflow
  - Undefined

#### 6.2.3.3.7 Set up Linearization Setpoints (X)

“System → Setup → Measurement  
→ Linearization → Setpoints (X)”



Ch1

---

Setpoints (X) 1 of 4

Lin X1:	0.000 ppm
Lin X2:	0.000 ppm
Lin X3:	0.000 ppm
Lin X4:	0.000 ppm
Lin X5:	0.000 ppm
Lin X6:	0.000 ppm
Lin X7:	0.000 ppm

Ch1

---

Setpoints (X) 4 of 4


Lin X25:	0.000 ppm
Lin X26:	0.000 ppm
Lin X27:	0.000 ppm
Lin X28:	0.000 ppm
Lin X29:	0.000 ppm
Lin X30:	0.000 ppm
Lin X31:	0.000 ppm
Lin X32:	0.000 ppm

To modify a linearization curve, within this menu enter up to 32 setpoint values (x values) for the new parameter sets.

When complete, return to the previous menu, enter ACTUALS (Y) and enter the corresponding (y) values.

#### 6.2.3.3.8 Set up Linearization Actuals (Y)

“System → Setup → Measurement  
→ Linearization → Actuals (Y)”



Ch1

---

Actuals (Y) 1 of 4

Lin Y1:	0.000 ppm
Lin Y2:	0.000 ppm
Lin Y3:	0.000 ppm
Lin Y4:	0.000 ppm
Lin Y5:	0.000 ppm
Lin Y6:	0.000 ppm
Lin Y7:	0.000 ppm

Ch1

---

Actuals (Y) 4 of 4

Lin Y25:	0.000 ppm
Lin Y26:	0.000 ppm
Lin Y27:	0.000 ppm
Lin Y28:	0.000 ppm
Lin Y29:	0.000 ppm
Lin Y30:	0.000 ppm
Lin Y31:	0.000 ppm
Lin Y32:	0.000 ppm

To modify a linearization curve, after having entered the setpoint values (x values) for the new parameter sets, within this menu enter the new actuals (y) values.

Four menu pages enable to enter up to 32 values.



*Take care to enter the same number of actuals as setpoints!*

#### 6.2.3.3.9 Polynomials Coefficients

“System → Setup → Measurement  
→ Linearization → Coefficients”



Range1 Uses:	Poly1
Range2 Uses:	Poly3
Range3 Uses:	Poly3
Range4 Uses:	Poly4
Coeffs Poly1..	
Coeffs Poly2..	
Coeffs Poly3..	
Coeffs Poly4..	
Calculation..	

- **"Range1 Uses...Range4 Uses"**: Assign polynomials to each range. Multiple assignments are supported.
- **"Coeffs Poly1..Coeffs Poly4"**: Submenus to enter polynomials coefficients.
- **"Calculation"**: Submenu to calculate the polynomials.

## 6.2.3.3.10 Enter Polynomials Coefficients

Overflow:	10.0 %
Underflow:	5.0 %
a0:	
a1:	
a2:	
a3:	
a4:	
RefValue	100000 ppm
State Poly1	No coeffs

Enter the coefficients here for a 4th order polynomial:

$$a4 * x^4 + a3 * x^3 + a2 * x^2 + a1 * x + a0$$

## 6.2.3.3.11 Calculate Polynomials

Linearization setpoints..	All poly
Calc Poly Set:	
Calculate!	
Cancel!	
State Poly1:	No Coeffs
State Poly2:	No Coeffs
State Poly3:	No Coeffs
State Poly4:	No Coeffs
▼ Merit	

- **"Linearization setpoint"**: Submenu for linearization setpoints.
- **"CalcPolySet"**: Start calculation of polynomials.

Ch1	Approximation setup
MaxItera:	100
Cut-off:	0.001

## 6.2.3.3.12 Linearization Setpoints

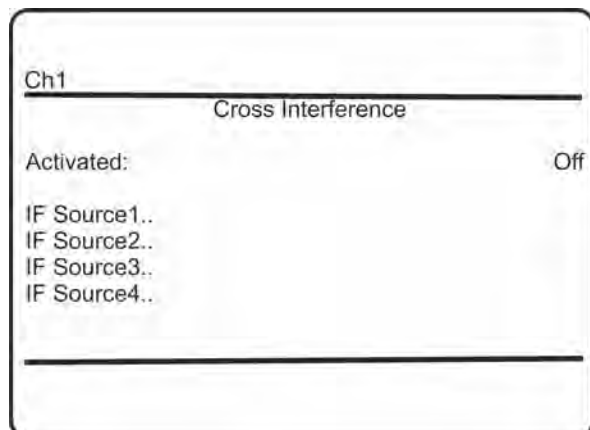
Ch1	Linearization setpoints
Setpoints (X)..	
Actuals (Y)..	
RefPoly1:	10000 ppm
RefPoly2:	10000 ppm
RefPoly3:	10000 ppm
RefPoly4:	10000 ppm
Clear all points!	

- **"Setpoints (X)"**: Submenu to enter setpoints.
- **"Actuals (Y)"**: Submenu to enter actuals.
- **"Clear all points!"**: Clear all entered setpoints.

#### 6.2.3.3.13 Set up Cross Interference

“System → Setup → Measurement  
→ Cross Interference”

This menu allows to configure up to four sources (in case of XECLD only external) for cross interference compensation.

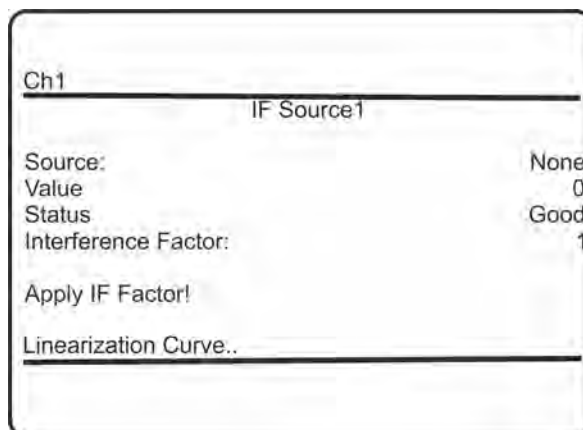



- **“Activated”**: Enable (On) or disable (Off) cross interference compensation.  
If the third parameter CalibOff is selected, cross interference compensation is activated, but disabled during calibrations.
- **“IF Source1...IF Source4”**: Up to four sources of concentration values can be configured for compensation.  
These submenus are demonstrated in the next section.

#### 6.2.3.3.14 Set up Cross Interference Source n

“System → Setup → Measurement  
→ Cross Interference → IF Source 1...4”

This menu allows to configure the source and effect of interference of the component, interfering the NO/NO<sub>x</sub> measurement.

- **“Source”**: Select the source of measuring values to be used for cross compensating.  
Available options:
  - None: source is disabled for cross compensation.
  - AIN1, AIN2: Analog input 1 or 2
  - Calc A ... Calc D: Result of Calc A to Calc D
- **“Value”**: Shows the interfering components value, currently applied.
- **“Status”**: Shows the interfering components status.  
Available options:
  - Absent
  - Good
- **“Interference Factor”**: Specify the influence of the selected source on the selected channel to be compensated.  
Accepted range:  $-1 \times 10^9 \dots +1 \times 10^9$
- **“Apply IF Factor!”**: Apply the configured settings.
- **“Linearization Curve”**: If the source signal is not linear, enter this submenu to configure a fourth-order polynomial.

#### 6.2.3.3.15 Setup Cross Interference Linearization Curve

“System → Setup → Measurement  
→ Cross Interference → IF Source 1...4  
→ Linearization Curve”

This menu allows to define an algorithm for unlinear source signals for the selected IF Source.







The menu figure below shows the default setup for the polynomials, which relates to a straight line. So, if the IF source signal is linear, no further action or changes in this menu are required.

Ch1

IF Source1

Reference Value:	1
IF Polynomial a1:	1.00000000
IF Polynomial a2:	0.00000000
IF Polynomial a3:	0.00000000
IF Polynomial a4:	0.00000000

- **“Reference Value”**: Reference value to normalize the linearization curve.  
Accepted range: - 1E + 9 ... + 1E + 9
- **“IF Polynomial a1...IF Polynomial a4”**: Enter up to four polynomial factors to linearize the interfering component's input signal with a fourth-order polynomial of the form:  
$$P(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4$$

## 6.2.3.3.16 Set up Measurement Average

“System → Setup → Measurement → Average”

Some applications, e.g. CEMS (Continuous Emissions Monitoring System), require to calculate and monitor concentration averages. Enter this menu to set up averaging.



Average

Method:	Sliding
Interval Time:	2 min
Next Average in:	0 s
Last Average:	2000.0 ppm
Sliding Time:	10 min
StartStopMethod:	Manual
Reset Averaging!	

- **“Interval Time”**: In this line, specify the averaging time.  
Accepted values: 0 ... 120 min
- **“Next average in”**: Elapsed time for the next average.
- **“Last average”**: Last average result.

## 6.2.3.3.17 Setup Measurement Delay

“System → Setup → Measurement → Delay”

This menu option allows to delay a measurement output (on all display, analog outputs, network, etc.).

Use this option to compensate signal delays between multiple analyzers, if very synchronous results are needed.



Ch1

Delay

Delay Time:	2.0 s
Delay Time Max	98.0 s

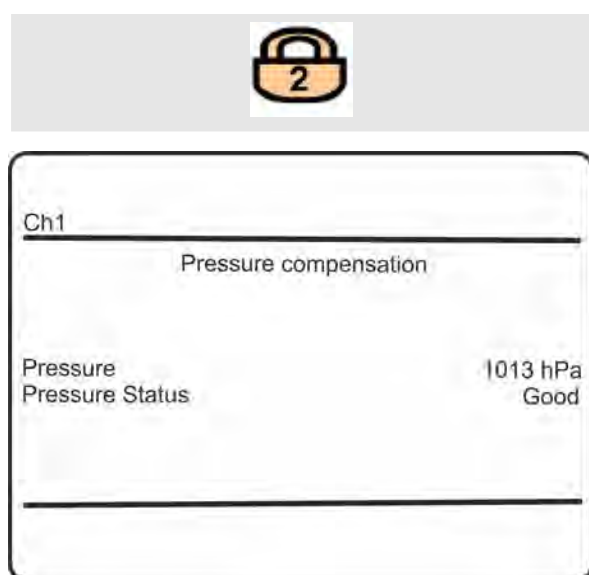


- **"Delay Time"**: Set up the output delay time.  
Accepted range: 0.0 s ... "Max. Delay time".
- **"Delay Time Max"**: The acceptable maximum delay time is internally calculated and cannot be changed.

## 6.2.3.3.18 Set up Pressure Compensation

**"System → Setup → Measurement  
→ Pressure Compensation"**

This menu shows the current ambient pressure and the sensor status.

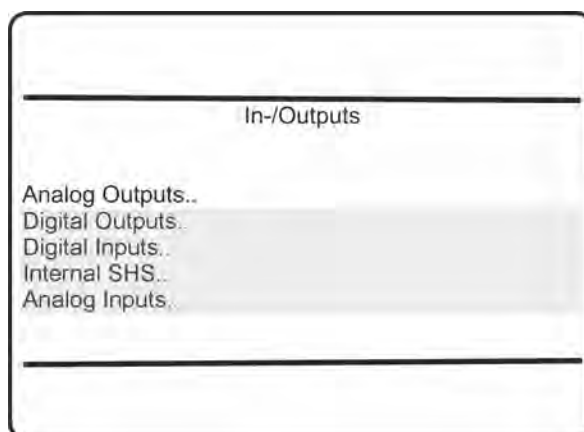


- **"Pressure"** and **"Pressure Status"**: Pressure currently used for pressure compensation and the status.

## 6.2.3.4 Setup In/Outputs

**"System → Setup → In/Outputs"**

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



Enter the submenu for the inputs or outputs you want to configure:

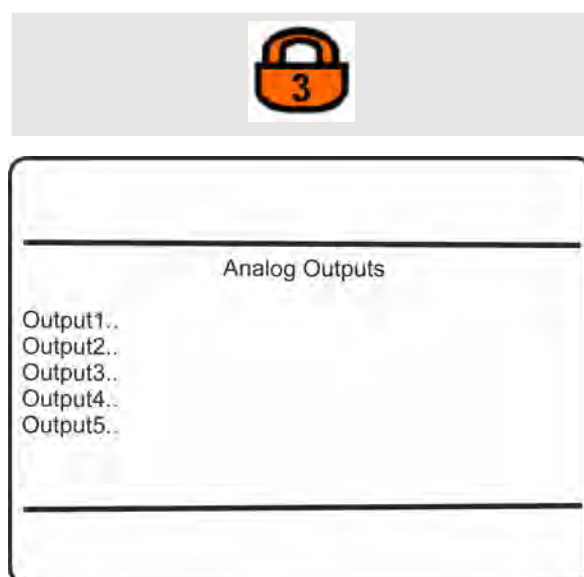
- **"Analog Outputs.."**: Analog outputs.
- **"Digital Outputs.."**: Digital outputs.
- **"Digital Inputs.."**: Digital inputs (optional).
- **"Internal SHS..."**: Internal sample handling system (not applicable for the XECLD).
- **"Analog Inputs..."**: Analog inputs (optional).

## 6.2.3.4.1 Set up Analog Outputs

**"System → Setup → In/Outputs  
→ Analog Outputs"**

Configure the analyzer's analog outputs.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.





Enter the submenu for the output you want to configure.

## 6.2.3.4.2 Set up Analog Output n

“System → Setup → In/Outputs  
→ Analog Outputs → Output1...5”



Signal:	Comp1
OutRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

“Signal”: Specifies the value associated with the selected output.

The following options are available:

Signal	Description
None	The analog output is deactivated
0 mA	A 0 or 4 mA signal is generated, e.g. to check the signal processing in an external system.  Whether a 0 or 4 mA signal is generated, is set by the “Out range” line.
20 mA	A 20 mA signal is generated, e.g. to check the signal processing in an external system.

Signal	Description
Comp1	Gas concentration
Temp1	Temperature
Press1	Pressure
Flow1	Flow
Calc A ... D	Result of calculator
RawVal1	Raw value
RangeID1 ... 5	ID of selected range
CLD-Samp-P	CLD sample pressure
CLD-O3-F	CLD ozone flow
CLD-Conv-T	CLD converter temperature
CLD-Mfld-T	CLD manifold block temperature
CLD-Elect-T	CLD electronics temperature
CLD-NOx mode	CLD NO/NO <sub>x</sub> valve state

Signal:	Comp1
OutRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

- “OutRange”:
  - 0-20 mA (dead zero) generates a 20 mA signal, if a concentration is measured at the upper limit of the signal range. A 0 mA signal is generated if the sample gas concentration equals the value specified with “LowScale”.
  - 4-20 mA (life zero): A 4 mA signal is generated if the concentration equals the value specified with “LowScale”, thus enabling to detect e.g. a broken cable.
- “Low Scale”: Enter a concentration, to equal the low output limit (0 or 4 mA)

- **"High Scale"**: Enter a concentration to equal the high output limit (20 mA)
- **"AutoScale"**: Enable (Yes) or disable (No) output autoscaling.
- **"FailMode"**: Selects the output's behavior under failure conditions, considering or not, the NAMUR recommendation NE 43.  
NE 43 defines output signal enabling to detect different types of failures or status (see Tab. 6-1). The related information is transmitted as a current signal, but outside the 4-20 mA measurement signal range.

Available options:

- Track: NE 43 not considered.
- HIGH + 10%: NE 43 failure signal level: "above".
- LOW - 10%: NE 43 failure signal level: "below".



*Factory settings are OutRange: 4-20 mA and FailMode: LOW - 10%, if not changed at the time of order.*

### 6.2.3.4.3 Operation Modes Acc. NAMUR NE 43

If **"OutRange"** is set to 0-20 mA, a 20 mA signal is generated, if the measured concentration equals **"Max Scale"**. A 0 mA signal is generated if the sample gas concentration is 0 (dead zero).

However, a severed cable also results in a signal value of 0. An external data acquisition system thus cannot detect such an failure and accepts a gas concentration of 0.

The commonly used method of detecting a severed cable is to apply an offset; a concentration corresponding to the lower range value is assigned an analog signal of 4 mA, enabling to detect a severed or disconnected cable. This live zero mode is activated by setting **"Out Range"** to 4-20 mA.

## Operation Modes Conforming to NAMUR 43 (NE 43) Recommendations

The operation modes described above do not generate a signal which enables detection of a failure in the measurement system. In such cases, the behavior of the output signal is undefined; either the last value is held, or a random value is sent. System failures thus cannot be detected by an external data acquisition system.

NE 43 gives recommendations for setting analog outputs in order to avoid these situations. They are implemented by X-STREAM analyzers as follows:

Setting "FailMode" to HIGH +10% or LOW -10% defines specific analog output signals for failures. Since these values are not output under normal operation conditions, a data acquisition system is enabled to distinguish between the following situations:

- Valid signal (signal within valid range; column C)
- Signal out of range (signal rises or falls slowly to the limits given in columns D or E and holds this value until the concentration returns to a valid level).
- Failure (signal out of range; column F).
- Severed cable (no signal; column G).

Column	Output signal, if						
	A	B	C	D	E	F	G
"OutOfRange"	"FailMode"	Failure signal level acc. NE 43	Measured value is valid	Measured value is below lower limit ("Low scale")	Measured value is above upper limit ("High scale")	An internal failure occurred	Cable is severed
0-20 mA	Track	-	0 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
4-20 mA	Track	-	4 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
0-20 mA	LOW - 10 %	below	0 ... 20 mA	-0.20 mA* (-1.80 ... -0.01 mA)**	20.50 mA* (20.01 ... 21.50 mA)**	-2 mA	0 mA
4-20 mA	LOW - 10 %	below	4 ... 20 mA	3.80 mA* (2.20 ... 3.99 mA)**	20.50 mA* (20.01 ... 21.50 mA)**	2 mA	0 mA
0-20 mA	HIGH + 10 %	above	0 ... 20 mA	-0.20 mA* (-1.80 ... -0.01 mA)**	20.50 mA* (20.01 ... 21.50 mA)**	> 21.7 mA	0 mA
4-20 mA	HIGH + 10 %	above	4 ... 20 mA	3.80 mA* (2.20 ... 3.99 mA)**	20.50 mA* (20.01 ... 21.50 mA)**	> 21.7 mA	0 mA

Fig. 60: Analog output failure modes



The application of values marked \* or \*\* depends on the setting of "Cut Mode".

Signal:	Comp1
OutOfRange:	0-20 mA
Low Scale:	0.00
High Scale:	100.00
AutoScale:	Yes
FailMode:	Track
0/4 mA:	0.00
20 mA:	100.00
Hold:	No

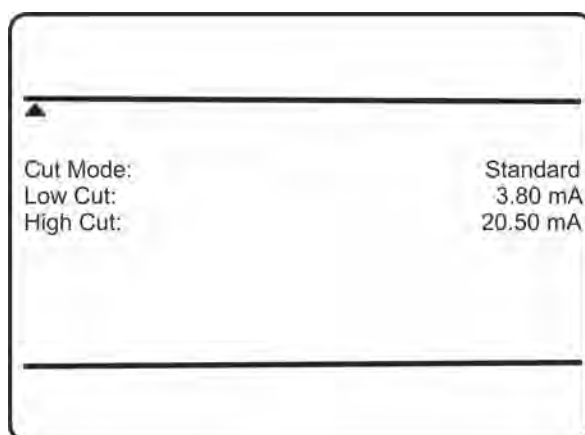
- **"0/4 mA"**: Enables to finetune the analog output: Set **"Signal"** to 0 mA and, while measuring the output current, in this line adjust it to the expected value.  
Accepted range: -10,000 ... +10,000
- **"20 mA"**: Enables to finetune the analog output: Set **"Signal"** to 20 mA and while measuring the output current, in this line adjust it to the expected value.  
Accepted range: -10,000 ... +10,000
- **"Hold"**: Selects the output's behavior during calibrations. If set to **Yes**:
  - the analog output is fixed to the last measured value
  - concentration alarms, which may otherwise be triggered by the concentrations of the calibration gases, are suppressed.
- **"Hold"**: If set to **No**:
  - the analog output signal always corresponds to the actual measured value during calibration; this may trigger alarms if limits are exceeded.



*This behavior may be undesirable if e.g. the unit is connected to a data acquisition system.*



*This second menu page appears only if **"Fail-Mode"** is set to something other than **Track**! It enables to specify the output's behavior in case the measured value exceeds the range (↪ **"Operation Modes Conforming to NAMUR 43 (NE 43) Recommendations"** on page 123).*



**"Low Cut"** is output if the measured value is below the lower range limit. **"High Cut"** is output if it exceeds the upper range limit.

- **"Cut Mode"**: specifies if Standard values or Configurable values are used for output.
- **"Low Cut"** and **"High Cut"**: If **"Cut Mode"** is set to **Standard**, these lines show the standard settings. For **"Low Cut"** they depend on the setting of **"OutRange"**.

OutRange	0-20 mA	4-20 mA
Low Cut	-0.20 mA	3.80 mA
High Cut	20.50 mA	

- If “Cut Mode” is set to Config, use these lines to adjust the related output signals. The accepted values for “Low Cut” again depend on the setting of “OutRange”.

OutRange	0-20 mA	4-20 mA
Low Cut	-1.80...-0.01 mA	2.20...3.99 mA
High Cut	20.01...21.50 mA	

## 6.2.3.4.4 Set up Digital Outputs

“System → Setup → In/Outputs  
→ Digital Outputs”

This first menu page enables to configure digital outputs 1 ... 4, which are the basic outputs, available with every XECLD ('X1' in the menu title refers to the instrument's I/O connector X1).

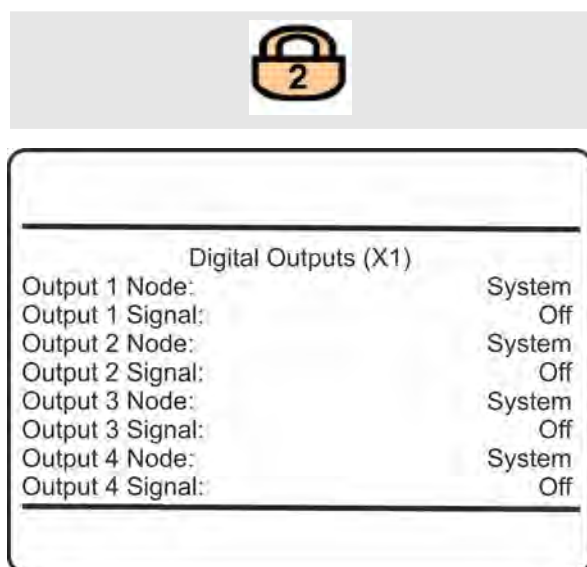


Fig. 61: Digital Outputs (X1)

- “Output1 Node...Output4 Node”: For each output 1 .. 4, specify within the “Node” line the signal source.

Available options: System or Ch1.

- if **System** is selected, analyzer specific signals are selectable.
- If **Ch1** is selected, measurement related signals are considered.

Once the “Node” is specified, for each output:

- 1...4 select what to output within the “Signal” line. Depending on the node, the list of available signals can vary.

## Node: System (related to analyzer)

Option	Description
Off	Switched off
On	Switched on
Heartbeat	Status changes every second (test mode)
Any Failure	Any failure, off-spec, maintenance request or function check status is set <sup>1)</sup>
Any OffSpec	
Any MaintRequ	
Any FctCheck	
Any Calibrating	Any calibration, zero or span calibration is ongoing
Any Zeroing	
Any Spanning	
Any ZeroCal Failed	A zero or span calibration failed
Any SpanCal Failed	
Any Range Low	Any measured value exceeds a current range
Any Range High	
Any ConcAlarm	Any channel triggered an alarm of the selected type <sup>2)</sup>
Any AvgAlarm	
Any TempAlarm	
Any PressAlarm	
Any FlowAlarm	
Reserved	Currently without function (storage place reserved for new functions)
V1...V20	Drive an external valve
Pump1...2	Drive an external pump
Ext Status1...8	An alarm is triggered



Option	Description
PLC Result1...20	Status of related PLC result
CalcA Rslt LoLo	The result of calculatorA exceeds the selected limit <sup>2)</sup>
CalcA Rslt Lo	
CalcA Rslt Hi	
CalcA Rslt HiHi	
CalcB Rslt LoLo . ... CalcD Rslt HiHi	Similar to CalcA, but for calculatorsB... D <sup>2)</sup>
Ain1... ..LoLo, ..Lo, ..Hi, ..HiHi	An alarm of the selected type is triggered by Analog Input 1 or 2 <sup>2)</sup>
Ain2.. ..LoLo, ..Lo, ..Hi, ..HiHi	
AnyValidation	Any validation is ongoing
AnyZeroValid	Any zero or span validation is Any SpanValid ongoing
AnyZeroValid	
Any ZeroValid Fail	A zero or span validation failed
Any SpanValid Fail	
NOx mode	NO/NO <sub>x</sub> mode
CLD-Samp-P ..LoLo, ..HiHi	An alarm of selected type for CLD sample pressure
CLD-O3-F ..LoLo, ..HiHi	An alarm of selected type for CLD ozone flow is triggered
CLD-Conv-T ..LoLo, ..HiHi	An alarm of selected type for CLD converter temperature is triggered.
CLD-Mfld-T ..LoLo, ..HiHi	An alarm of selected type for CLD manifold block temperature is triggered
CLD-Elect-T ..LoLo, ..HiHi	An alarm of selected type for CLD electronics temperature is triggered

<sup>1)</sup> If assigned, the output is automatically configured Failsafe.

<sup>2)</sup> Parameter “Alarms Output Failsafe” can be used to manually configure Failsafe for all outputs assigned to the same type of option (indexed with <sup>2)</sup>).

## Node: Ch1

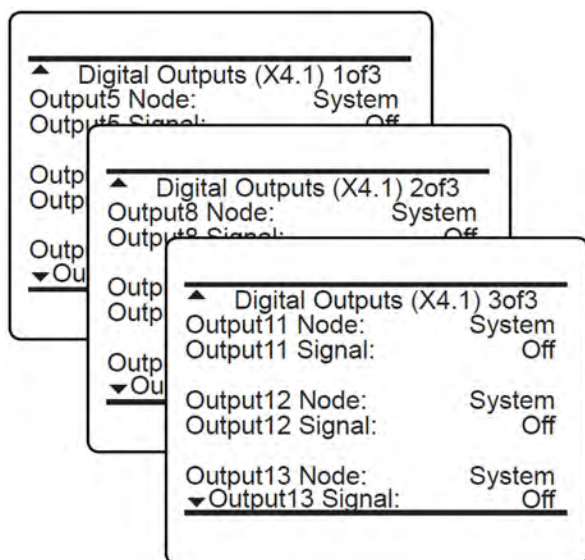
Option	Description
Off	Switched off
On	Switched on
Heartbeat	Status changes every second (test mode)
Failure	A channel specific failure, off-spec, maintenance request or function check status is set <sup>1)</sup>
OffSpec	
MaintRequ	
FctCheck	
Calibrating	The channel is calibrating, zeroing or spanning
Zeroing	
Spanning	
ZeroCal Failed	A channel specific zero or span calibration failed
SpanCal Failed	
Range Underflow	Measured value exceeds Range Overflow current range
Range Overflow	
Range 1...4	The selected range is active
Conc LoLo	A concentration alarm of the selected type is triggered <sup>2)</sup>
Conc Lo	
Conc Hi	
Conc HiHi	
Average.. ..LoLo, ..Lo, ..Hi, ..HiHi	A concentration average alarm of the selected type is triggered <sup>2)</sup>
Temperature.. ..LoLo, ..Lo, ..Hi, ..HiH	A temperature alarm of the selected type is triggered <sup>2)</sup>
Pressure.. ..LoLo, ..Lo, ..Hi, ..HiH	A pressure alarm of the selected type is triggered <sup>2)</sup>

Option	Description
Flow.. ..LoLo, ..Lo, ..Hi, ..HiH	A flow alarm of the selected type is triggered <sup>2)</sup>
Validating	A channel specific validation is ongoing
ZeroValid	A channel specific zero or SpanValid span validation is ongoing
SpanValid	
ZeroValidFail	A channel specific zero or SpanValidFail span validation failed
SpanValidFail	

<sup>1)</sup> If assigned, the output is automatically configured Failsafe.

<sup>2)</sup> Parameter “Alarms Output Failsafe” can be used to manually configure Failsafe for all outputs assigned to the same type of option (indexed with <sup>2)</sup>).

If the instrument features optional digital I/O boards, similar menu pages for the additional digital outputs are unlocked. The options for each output are as described before.



Menu pages 4 ... 6 (titled "Digital outputs (X4.1)") enable to configure outputs 5 ... 13 on the expansion board ('X4.1' in the menu title refers to the instrument's I/O connector X4.1).

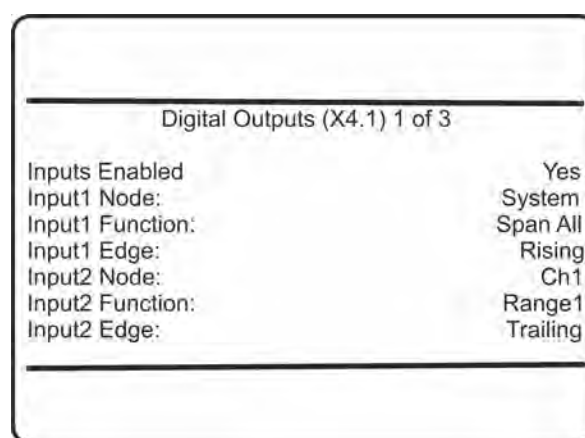
## 6.2.3.4.5 Set up Digital Inputs

“System → Setup → In/Outputs → Digital Inputs”

If the instrument features an optional digital I/O board, this menu appears, enabling to configure the digital inputs.



Menu pages 1...3 (titled 'Digital inputs (X4.1)') enable to configure inputs 1...7 on the first expansion board ('X4.1' in the menu title refers to the instrument's I/O connector X4.1).



For each input 1...7 specify the signal source within the “Node” line.

Available options: System or Ch1.

If Ch1 is selected, only signals valid for the selected channel are selectable.

If System is selected, any system signal is selectable.

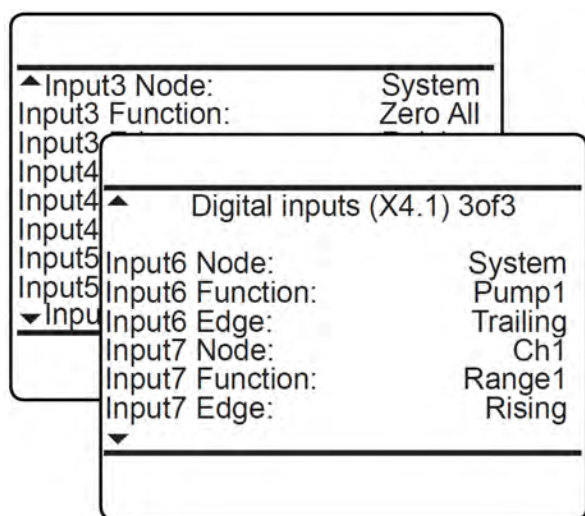


Fig. 62: Node

Once the “Node” is specified, for each input:

- select the “Function” of that input (depending on the node, the list of available signals varies).
- select how the input is to be triggered: by **Rising** edge, or **Trailing** edge.

#### Node: System

Input <i>n</i> Function	
Option	Description
None	Not used
Zero All	Carry out the selected calibration procedure, or cancel any ongoing calibration
Span All	
Zero&Span All	
Cancel All	
ProgSequ	Perform calibration sequence
Blowback	Activate blowback
CalCheckMod	Perform calibration check
Reserved	Currently without function
Failure	The input signal activates the related analyzer NAMUR status
OffSpec	
MaintRequ	
FctCheck	

Input <i>n</i> Function	
Pump1...2	Activate related pump
ExtStatus1...8	Input signal is assigned the selected alarm signal
Datalogger	Start data logger
Hold AO1...AO5	Put Analog Output 1...5 into hold mode
ZeroValid All	Carry out the selected validation procedure
SpanValid All	
Zero & SpanValid All	
FlowAlm	Trigger a flow alarm
NOx mode	Switch to NO/NO <sub>x</sub> mode on High/Low signal

#### Node: Ch1

Input <i>n</i> Function	
Option	Description
None	Not used
ZeroCal	Carry out the selected calibration procedure, or cancel any ongoing calibration
SpanCal	
Zero&SpanCal	
Cancel	
Range 1...4	Activate the selected range
Failure	The input signal activates the related channel NAMUR status
OffSpec	
MaintRequ	
FctCheck	
SampleGas	Open related valve
ZeroGas	
SpanGas1...4	
AllClosed	Close all valves
Blowback	Activate blowback
ConcAlaOff	Switch off concentration alarms monitoring

Input <i>n</i> Function	
ConcAlaOn	Switch on concentration alarms monitoring
ZeroValid	Carry out the selected valiSpanValidation procedure
SpanValid	
Zero&SpanValid	
FlowAlm	Trigger a flow alarm

## 6.2.3.4.6 Set up Internal SHS

“System → Setup → In/Outputs → Internal SHS”



*This menu is not applicable for an XECLD.*

## 6.2.3.4.7 Set up Analog Inputs

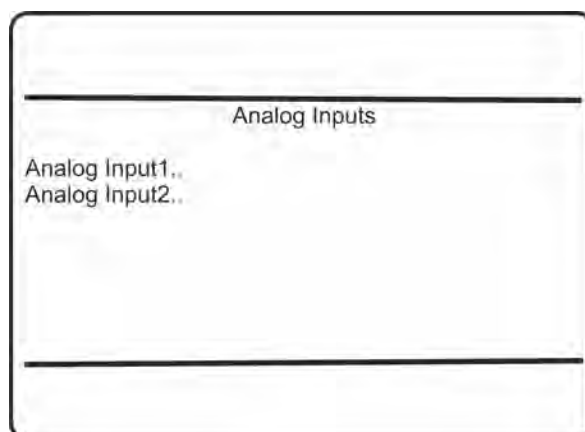
“System → Setup → In/Outputs → Analog Inputs”

Enter this menu to configure the optional analog inputs.



*If the instrument does not feature analog inputs, this menu is not available.*

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



“Analog Input1/Analog Input2”: Select the analog input you want to configure.

## 6.2.3.4.8 Set up Analog Input *n*

“System → Setup → In/Outputs → Analog Inputs → Analog Input1...2”

This menu allows to select the type of signal, provided by the external source.



Available options:

Option	Description
Test	The instrument internally generates a step-like signal for testing purposes.
Off	Input is switched off.
0..10V	Voltage or current signal is applied.
0..1V	
0..20mA	

Analog Input1	
Mode:	0..20mA
Max. Good Value:	800
Min. Good Value:	1100
Coefficients..	
ADC Value	8388608
Calc. Input Value	1013
Status	Good

Coefficients	
Coeff a0:	0
Coeff a1:	0
Coeff a2:	0
Coeff a3:	0
Coeff a4:	0
Input normalized to 0..11	

- **"Max. Good Value" and "Min. Good Value":**  
These lines specify the range for the input value to be accepted as 'good'. The (not shown) unit for these entries is the measurement unit of the external source, such as e.g. pressure sensor: hPa, flow sensor: l/min, ...
- **"Coefficients":** Opens the submenu COEFFICIENTS.
- **"ADC Value":** Shows the internal ADC output (informative).
- **"Calc. Input Value":** Shows the calculated input value, based on the conversion coefficients a0..a4, as specified in the submenu.
- **"Status":** Input value status.  
Possible entries:
  - Absent
  - Failure
  - Good
  - Simulated (e.g. when in test mode)

#### 6.2.3.4.9 Set up Coefficients

*"System → Setup → In/Outputs → Analog Inputs → Analog Input1...2 → Coefficients"*

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



- **"Coeff a0....Coeff a4":** Enter the coefficients for the input signal here, considering:
  - it is for a polynomial equation.
  - it is normalized to 0...1 (see note in menu).

Polynomial equation:

$$P(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + a_4x^4$$

#### 6.2.3.5 Set up Communication

*"System → Setup → Communication"*

This menu allows to setup the interface parameters to meet the configuration of your host system.

If the system is setup correctly, the access code for Level 3 must be entered to gain access to this menu.




Communication	
Serial..	
Web Server:	On
Ethernet1..	
Ethernet2..	

- “Serial..”: Configure the serial interface.
- “Web Server”: Specify if (On) or not (No) a web server connection is used.
- Configure “Ethernet1” or “Ethernet2 ” communication.

## 6.2.3.5.1 Set up Communication Serial

“System → Setup → Communication → Serial”



Serial

Protocol:	Modbus-RTU
32Bit Mode:	16BitLow
Mbus ID:	1
Baud Rate:	19200
Parity:	Even
Stop Bits:	1

- “Protocol”: Select the Modbus protocol.  
Available options:
  - MODB-RTU
  - None
- “32bit Mode”: Modbus mode of operation.  
Available options:
  - 32Bit (=Daniel mode)
  - 16BitLow (=Modicon mode, LOW word first)
  - 16BitHigh (=Modicon mode, HIGH word first)
- “Mbus ID”: Enter instrument ID for network.  
Accepted values:
  - 1 .. 254
- “Baud Rate”: Select baud rate for the serial interface.  
Available options:
  - 2400
  - 4800
  - 9600
  - 19200
- “Parity”: Set whether a parity bit is used.  
Available options:

- None
- Even
- Odd

- “Stop Bits”: Number of Stop Bits.

Available options:

- 1
- 2

## 6.2.3.5.2 Set up Communication Ethernet n

“System → Setup → Communication  
→ Ethernet1...2”



Within these menus, configure the Ethernet communication for connector 1 or 2.

Most entries are standard, to be set up to meet local network configurations.

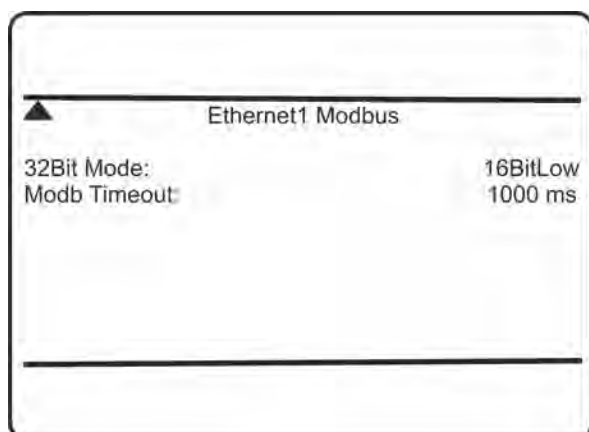
Enter the second menu page to configure the Modbus parameters.

Ethernet1

MAC	123456789
IP:	123.456.78.9
Subnet:	255.255.255.1
Gateway:	123.456.78.0
Use DHCP:	Yes
IP Status	Ready
Apply Configuration!	

- “IP”, “Subnet”, “Gateway”: If the network does not feature a DHCP server, enter these lines to configure the network settings manually.
- “Use DHCP”: If the network does not feature a DHCP server, select No to enter the network settings manually.
- “IP Status”: If the network features a DHCP server, “IP Status” turns to Ready if a valid IP address has been assigned.
- “Apply Configuration!”: To apply any changes made on this first menu page, press enter in this line.





- **“32bit Mode”**: Modbus mode of operation.  
Available options:
  - 32 Bit (= Daniel mode)
  - 16 BitLow (= Modicon mode, LOW word first)
  - 16 BitHigh (= Modicon mode, HIGH word first)
- **“Modb Timeout”**: Modbus timeout.  
Accepted values:
  - 500 ... 10,000 ms



At maximum of two hosts at a time can connect to the analyzer. “MBus timeout” specifies the time interval to elapse before a host without activity is disconnected.

### 6.2.3.6 Set up Limit Alarms

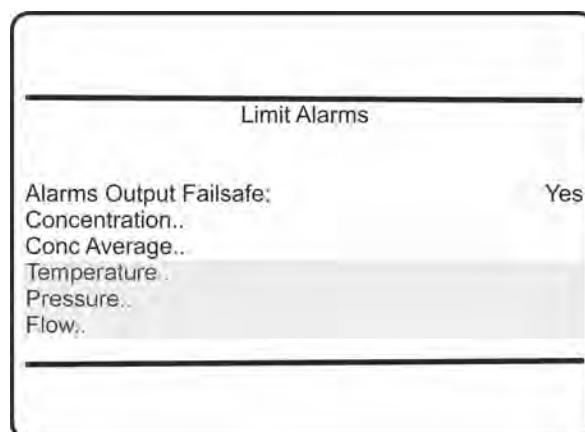
“System → Setup → Limit Alarms”

This menu and its submenus enable to configure a couple of alarm conditions.

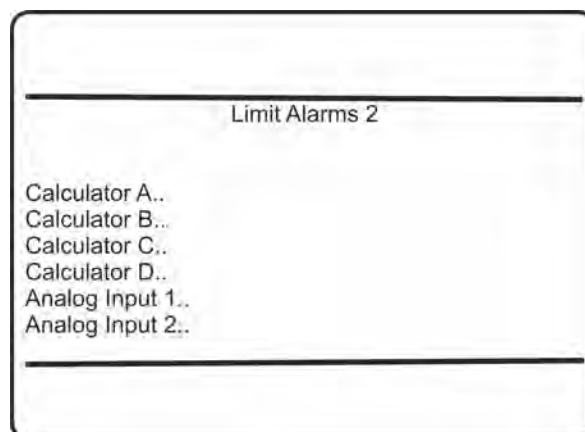


In case an alarm is activated, a status is set and the related pictogram shows in the display. Also digital outputs may be configured to be activated (🔗 Chapter 6.2.3.4.4 “Set up Digital Outputs” on page 125).

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



- **“Alarms Output Failsafe”**: Select if the alarm outputs are failsafe (Yes) or not (No): Failsafe means, relay output coils are powered during normal operation.
- **“Concentration..”**: Configure concentration alarms.
- **“Conc Average”**: Configure alarms for concentration averages.
- **“Temperature”**: Configure temperature alarms (optional).
- **“Pressure”**: Configure pressure alarms (optional).
- **“Flow”**: Configure flow alarms (optional).



XECLD analyzers can be upgraded with optional software packages, to provide four calculators (A ... D).

- **“Calculator A...Calculator D”**: Their results can be monitored to activate alarms.
- **“Analog Input 1 ” and “Analog Input 2”**: Open the submenu ANALOG INPUT.

#### 6.2.3.6.1 Set up Limit Alarm Concentration

“System → Setup → Limit Alarms  
→ Concentration”



To configure concentration alarm levels for averaging measurements ↗ Chapter 6.2.3.6.3 “Set up Concentration Average Alarms” on page 133.

Ch1

---

Concentration

Alarm Monitor: On

LoLo Level: 50.000 ppm

Lo Level: 100.000 ppm

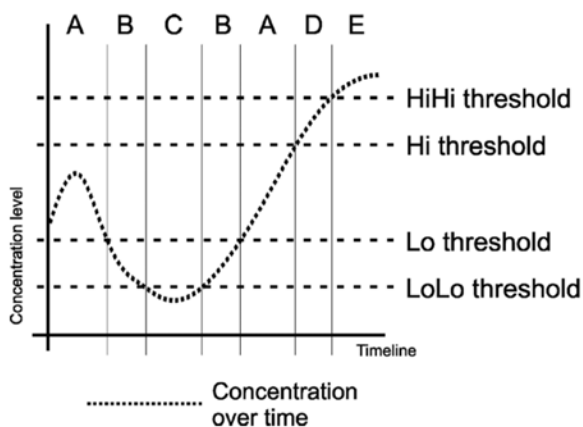
Hi Level: 400.000 ppm

HiHi Level: 600.000 ppm

Hysteresis: 10.000 ppm

States..

- “Alarm Monitor”: Switch On or Off the alarm monitor.
- Specify up to four concentration (threshold) levels:
  - “LoLo Level” and “Lo Level” are to be set up below the expected concentration.
  - “HiHi Level” and “Hi Level” are to be set up above the expected concentration.
 See the figure below for details.
- “Hysteresis”: Specify the hysteresis to be considered around the concentration levels, to avoid oscillating alarms.
- “States..”: Current alarm states.



HiHi und LoLo are main alarms, Hi and Lo are pre-alarms.

## 6.2.3.6.2 View Concentration Alarms States

“System → Setup → Limit Alarms  
→ Concentration → States”



This menu gives an overview of activated alarms, based on the currently measured “Concentration”.

Ch1

---

Concentration Alarms

LoLo Alarm: Off

Lo Alarm: On

Hi Alarm: Off

HiHi Alarm: Off

Concentration 2000.0 ppm

## 6.2.3.6.3 Set up Concentration Average Alarms

“System → Setup → Limit Alarms  
→ ConcAverage”



To configure concentration alarm levels for non-averaging measurements ↗ Chapter 6.2.3.6.1 “Set up Limit Alarm Concentration” on page 132.

If concentration averaging is active, specify concentration alarms within this menu. In this case, an alarm is only activated if an average value exceeds one of the given levels.

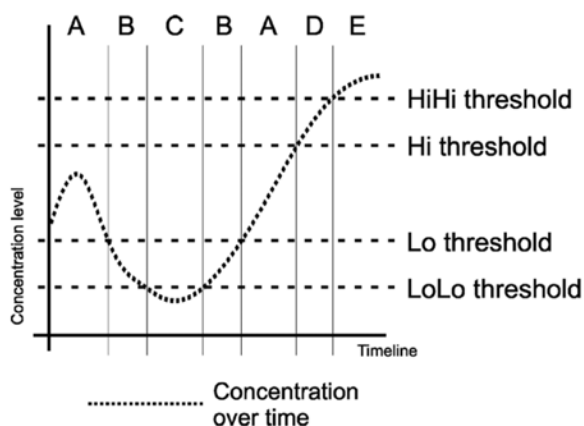
Ch1

Concentration

Alarm Monitor:	On
LoLo Level:	50.000 ppm
Lo Level:	100.000 ppm
Hi Level:	400.000 ppm
HiHi Level:	600.000 ppm
Hysteresis:	10.000 ppm

States..

- **“Alarm Monitor”**: Switch On or Off the alarm monitor.
- Specify up to four concentration (threshold) levels:
  - **“LoLo Level”** and **“Lo Level”**: Are to be setup below the expected concentration.
  - **“HiHi Level”** and **“Hi Level”**: Are to be setup above the expected concentration.
 See the figure below for details.
- **“Hysteresis”**: Specify the hysteresis to be considered around the concentration levels, to avoid oscillating alarms.
- **“States..”**: To view the current alarm states.



HiHi und LoLo are main alarms, Hi and Lo are pre-alarms.

## 6.2.3.6.4 Set up Alarms Conc Average States

“System → Setup → Limit Alarms  
→ ConcAverage → States”



This menu gives an overview of activated alarms, based on the currently measured “Average” of concentration.

Ch1

ConcAverage Alarms

LoLo Alarm	Off
Lo Alarm	Off
Hi Alarm	On
HiHi Alarm	Off

Average 468.000 ppm

## 6.2.3.6.5 Set up Temperature Alarms

“System → Setup → Limit Alarms  
→ Temperature”

Configuring temperature alarms is similar to the procedure for concentration alarms ↗ Chapter 6.2.3.6.1 “Set up Limit Alarm Concentration” on page 132.

## 6.2.3.6.6 Set up Pressure Alarms

“System → Setup → Limit Alarms → Pressure”

Configuring pressure alarms is similar to the procedure for concentration alarms ↗ Chapter 6.2.3.6.1 “Set up Limit Alarm Concentration” on page 132.

## 6.2.3.6.7 Set up Flow Alarms

“System → Setup → Limit Alarms → Flow”

Configuring flow alarms is similar to the procedure for concentration alarms ↗ Chapter 6.2.3.6.1 “Set up Limit Alarm Concentration” on page 132.

## 6.2.3.6.8 Set up Alarms Calculator *n*

“System → Setup → Limit Alarms  
→ Calculator A...D”



The XECLD analyzer can be upgraded with optional software packages to provide four calculators (A ... D). The results can be monitored to activate alarms.

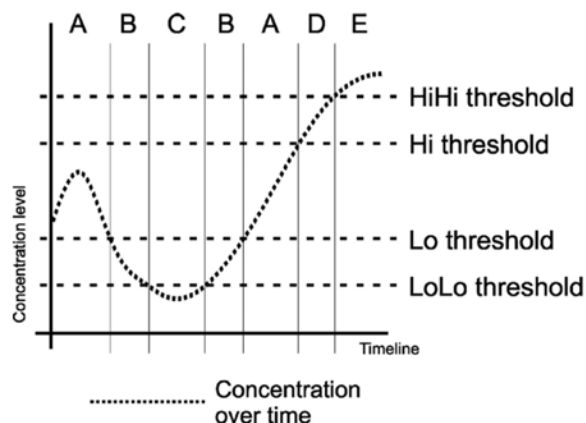


*This menu is available only if a valid software upgrade code has been purchased and entered.*

*For more information on calculators, see the associated separate software features documentation.*

Ch1	
Calculator A	
Alarm Monitor:	On
LoLo Level:	50.000
Lo Level:	100.000
Hi Level:	400.000
HiHi Level:	600.000
Hysteresis:	1000
States..	

- “Alarm Monitor”: Switch On or Off the alarm monitor for the current calculator.
- Specify up to four concentration (threshold) levels:
  - “LoLo Level” and “Lo Level”: Are to be set up below the expected concentration.
  - “HiHi Level” and “Hi Level”: Are to be set up above the expected concentration.
 See the figure below for details.
- “Hysteresis”: Specify the hysteresis to be considered around the concentration levels, to avoid oscillating alarms.
- “States..”: To view the current alarm states.



*The unit used for calculator results is taken from the entry at SETUP - CALCULATOR.*

## 6.2.3.6.9 Set up Alarms Calculator *n* States

“System → Setup → Limit Alarms  
→ Calculator *n* → States”



This menu gives an overview of activated alarms, based on the currently calculated “Result *n*” (here of Calculator A).

Ch1	
Calculator A Alarms	
LoLo Alarm	Off
Lo Alarm	Off
Hi Alarm	Off
HiHi Alarm	Off
Result A	468.000 Unit A

## 6.2.3.6.10 Set up Limit Alarms for Analog Input *n*

“System → Setup → Limit Alarms  
→ Analog Input *n*”



Ch1	
Analog Input 1	
Alarm Monitor:	On
LoLo Level:	50.000 ppm
Lo Level:	100.000 ppm
Hi Level:	400.000 ppm
HiHi Level:	600.000 ppm
Hysteresis:	10.000 ppm
States..	

- “Alarm Monitor”: Switch On or Off the alarm monitor for the analog input.
- Specify up to four concentration (threshold) levels:
  - “LoLo Level” and “Lo Level”: Are to be set up below the expected concentration.
  - “HiHi Level” and “Hi Level”: Are to be set up above the expected concentration.
- “Hysteresis”: Specify the hysteresis to be considered around the concentration levels to avoid oscillating alarms.
- “States..”: To view the current alarm states.



HiHi und LoLo are main alarms, Hi and Lo are pre-alarms.

#### 6.2.3.6.11 Set up Alarms Analog Input n States

“System → Setup → Limit Alarms  
→ Analog Input n → States”



This menu gives an overview of activated alarms, based on the currently calculated “Calc. Input Value” (here of Analog Input 1).

Limit Alarms	
LoLo Alarm	Off
Lo Alarm	Off
Hi Alarm	Off
HiHi Alarm	Off
Calc. Input Value	0 Unit 1

#### 6.2.3.7 Set up Installed Options

“System → Setup → Installed Options”



*Don't change settings in this menu without experienced knowledge! Wrong settings may result in a defective instrument.*

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



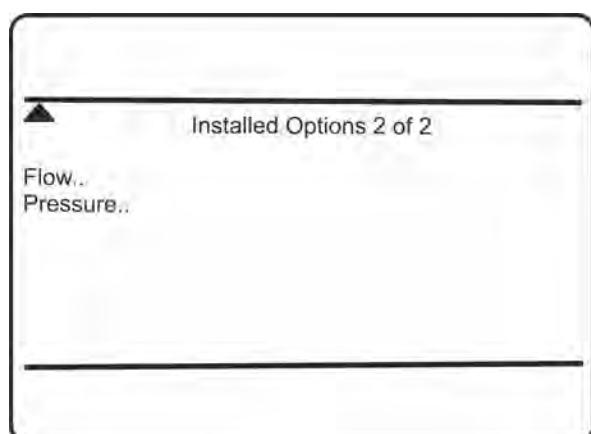
Installed Options	
Package	None
Valves	None
Pump	None
DIO#1 Installed	Yes
DIO#2 Installed	No
Anal. Outputs	4
AIN Installed	No



- “Licenses..”: Some software features are optional and can be unlocked with a license code.
- “Valves”, “Pumps Installed”, “DIO#1 Installed”, “DIO#2 Installed”: Show if the related optional component is installed with the current instrument (Yes) or not (None), shows how they are installed (“Valves”: Internal, External or Int +Ext), or which (“Pumps”: Pump 1, Pump 1&2).
- “Anal. Outputs”: Indicates how many analog outputs are installed (0 ... 5).
- “AIN Installed”: Indicates if analog inputs are installed or not.



The XECLD does not feature internal valves or pumps and has only one optional DIO extension.



- “Flow..”: Set up flow sensor installation.
- “Pressure..”: Set up pressure sensor installation.

## 6.2.3.7.1 Set up Installed Options Licenses

“System → Setup → Installed Options → Licenses”



This menu is used to unlock software features, to be purchased separately.

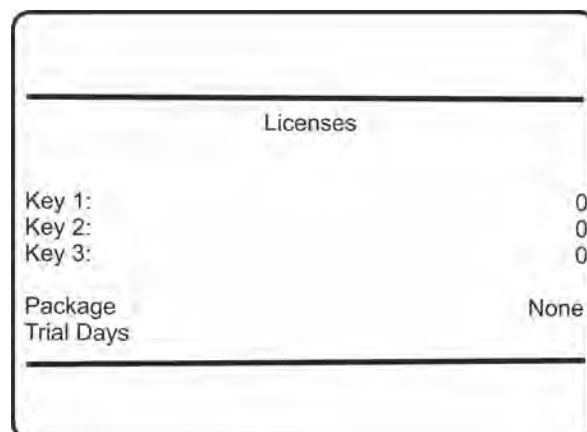
By default, X-STREAM XE analyzers provide a web browser interface and a basic data logger. Three optional software packages are available, to upgrade the software:

- Enhanced: add PLC and calculator.
- Advanced: add advanced data logger, event/calibration logger and e-mail support.
- Professional: add all enhanced and advanced package options.



For more information on these options, see the associated separate software features manual.

## Trial version



Enter 88888 into each line (“Key 1” to “Key 3”) to unlock a 30 days full version (Professional) trial. This trial is available only once for each analyzer, and only if no other package has been activated before (“Package” shows None). Once entered, “Trial Days” shows the remaining time, until the package is disabled.

To unlock one of above packages for unlimited time, contact the EMERSON sales office. Have the analyzer serial number at hand to purchase and receive an unlock code.

The code (three 5-digit numbers) has to be entered into lines “Key 1” to “Key 3”. If the entered code is correct, “Package” shows the related name (see above).

Upgrades from one to another package are possible at any time by purchasing and entering a valid unlock code.



## 6.2.3.7.2 Set up Installed Options Flow

“System → Setup → Installed Options → Flow”



The XECLD is internally equipped with different flow and pressure sensors. Nevertheless, external sensors can be connected via analog inputs.

Ch1	
Flow	
Flow Source:	AIN1
Flow	1.00 l/min
SensorMin.:	0.00 l/min
SensorMax.:	1.50 l/min
Flow Status	Good
Min Scale:	0.00 l/min
Max Scale:	2.00 l/min

- “Flow Source”: Select the flow measurement data source.  
Available options:
  - AIN1, AIN2: analog inputs
- “Flow”: The current measured flow.
- “SensorMin.” or “SensorMax.”: The sensor’s minimum and maximum limits.
- “Flow Status”: The sensor’s status.  
Possible entries:
  - Good
  - Absent
  - Failure
- “Min Scale”: In case, the measured values are transferred to an analog output, a 4 mA signal is generated, if the flow equals the value specified under “Min Scale”.
- “Max Scale”: In case, the measured values are transferred to an analog output, a 20 mA signal is generated, if the flow equals the value specified under “Max Scale”.

## 6.2.3.7.3 Set up Installed Options Pressure

“System → Setup → Installed Options → Pressure”



The XECLD is internally equipped with different flow and pressure sensors. Nevertheless, external sensors can be connected via analog inputs.

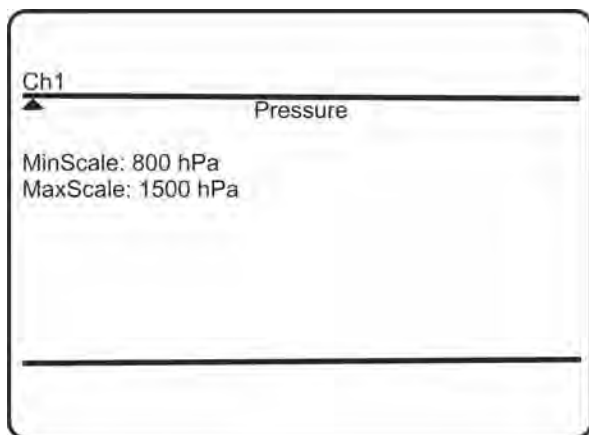
Ch1	
Pressure	
Pressure Source:	AIN1
Pressure	1013 hPa
SensorMin:	800 hPa
SensorMax:	1100 hPa
Pressure Status	Good
Reference:	1013 hPa
Manual Pressure:	1014 hPa
▼ Compensation:	Off

- “Pressure Source”: Select the pressure measurement data source.  
Available options:
  - AIN1, AIN2: analog inputs
  - Manual: enter the current pressure manually
- “Pressure”: The current measured pressure, or currently entered manual pressure value.
- “SensorMin” or “SensorMax”: The sensor’s minimum and maximum limits, or the limits for manual pressure entries.
- “Pressure Status”: The sensor’s status.  
Possible entries:
  - Good
  - Absent
  - Failure
- “Reference”: Enter the reference pressure for pressure compensation here.
- “Manual Pressure”: Manually enter the current ambient pressure here.



If “Pressure source” is set to an option other than Manual, this line is hidden.

- “Compensation”: Enable or disable pressure compensation.  
Available options:
  - On
  - Off



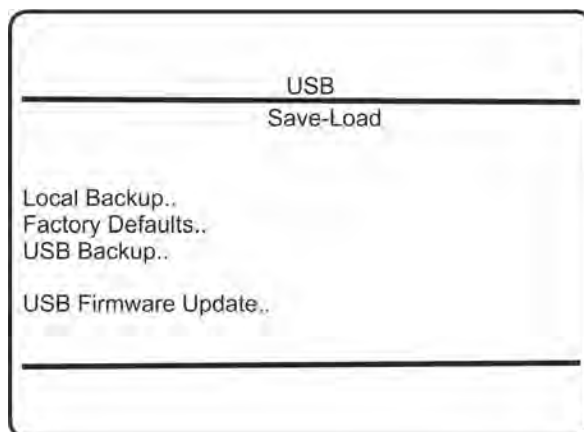
- “MinScale”: In case, the measured values are transferred to an analog output, a 4 mA signal is generated, if the pressure equals the value specified under “MinScale”.
- “MaxScale”: In case, the measured values are transferred to an analog output, a 20 mA signal is generated, if the pressure equals the value specified under “MaxScale”.

## 6.2.3.8 Set up Save-Load

“System → Setup → Save-Load”

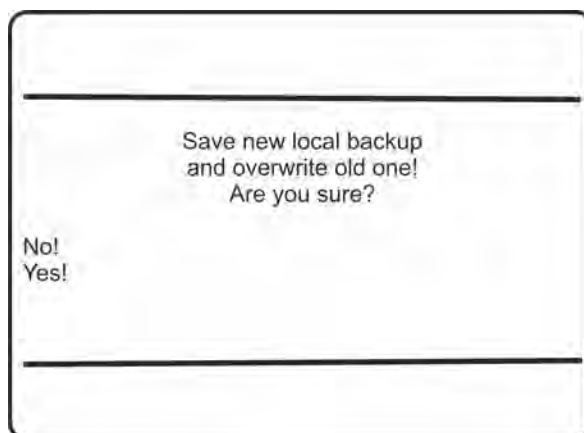
This menu allows to save or restore configuration files from or to your analyzer.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



- “Local Backup..”: Enables to save/restore analyzer configuration data to/from a special internal memory area.
- “Factory Defaults..” Restore the factory configuration.
- “USB Backup..”: Save/restore analyzer configuration data to/ from external USB devices.
- “USB Firmware Update..”: Update the analyzer firmware with a new version, to be provided on a connected USB device.

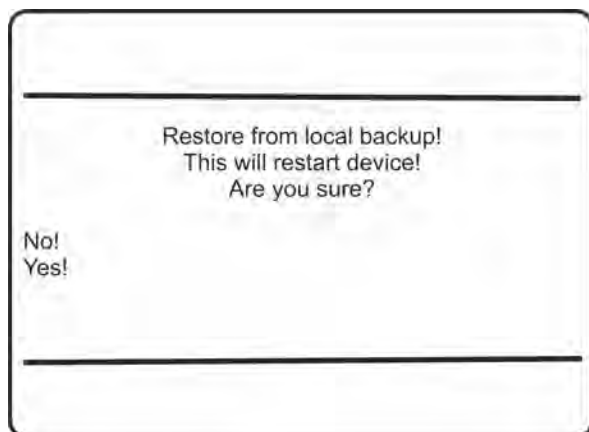
### 6.2.3.8.1 Notes on Save-Load Procedures



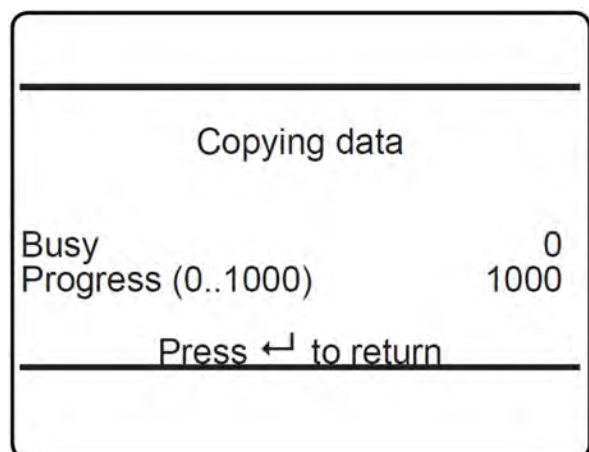
After selecting any 'backup' procedure, a safety prompt appears: select “Yes!” to start the backup; “No!” to cancel.



There is no undo for this procedure, overwriting any older backup!



After selecting any 'restore' procedure, a safety prompt appears: select "Yes!" to start the backup; "No!" to cancel.



While a backup or restore procedure is active, an information screen appears as shown above:

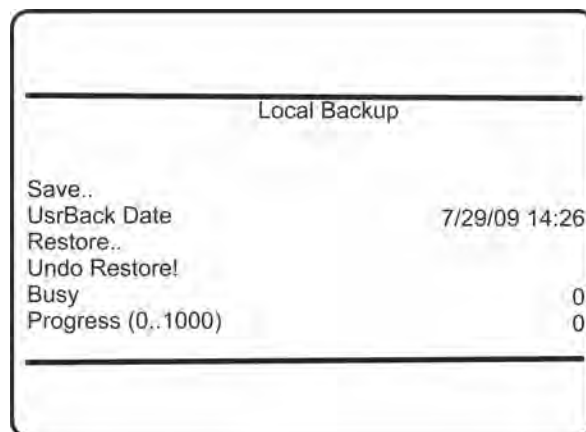
Wait until "Progress (0..1000)" shows 1000, then press ENTER to return to the previous menu.

## 6.2.3.8.2 Save-Load Local Backup

"System → Setup → Save-Load  
→ Local Backup"



This menu allows to save or restore the current analyzer configuration to/from a special internal memory area.



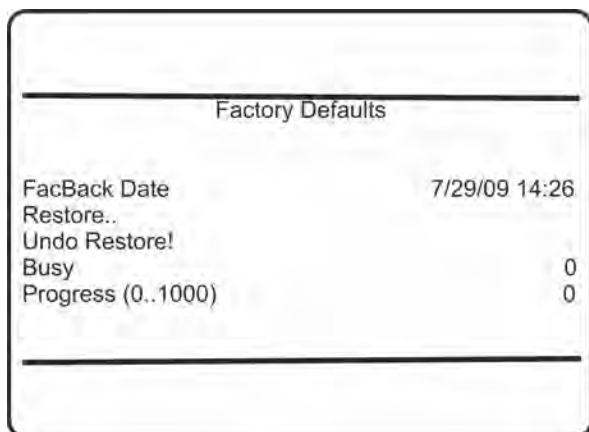
- "Save..": Save the configuration data.
- "UsrBack Date": Date of last backup.
- "Restore..": Restore saved configuration data.
- "Undo Restore!": Undo a restore.
- "Progress (0..1000)": Wait until "Progress (0..1000)" shows 1000, then press ENTER to return to LOCAL BACKUP.

## 6.2.3.8.3 Save-Load Factory Defaults

"System → Setup → Save-Load  
→ Factory Defaults"



*Factory defaults are saved only once after factory startup and can only be restored! Consider the notes in Chapter 6.2.3.8.1 "Notes on Save-Load Procedures" on page 139.*



- “FacBack Date”: Date of last backup.
- “Restore..”: Restore saved factory configuration data.
- “Undo Restore!”: Undo a restore.
- “Progress (0..1000)”: Wait until “Progress (0..1000)” shows 1000, then press ENTER to return to LOCAL BACKUP.

## 6.2.3.8.4 Save-Load USB Backup

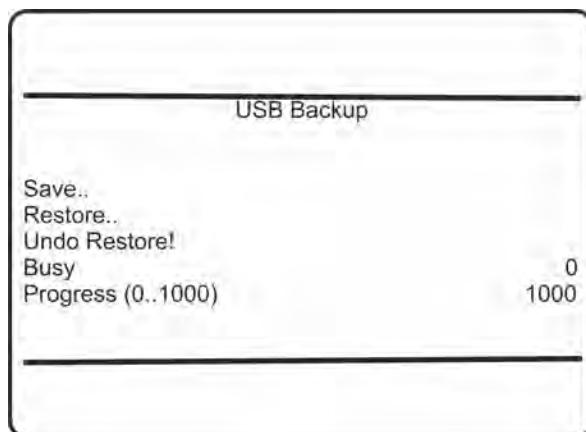
“System → Setup → Save-Load  
→ USB Backup”



This menu enables to save or restore the current analyzer configuration to/from an external USB device.



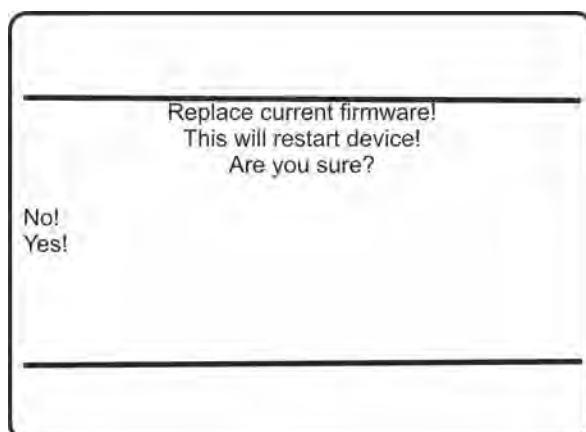
*Take care to consider the important information ↻ “Preparing USB Backup” on page 190, before starting any procedures with USB devices!*



- “Save..”: Save the configuration data.
- “Restore..”: Restore saved configuration data.
- “Undo Restore!”: Undo a restore.
- “Progress (0..1000)”: Wait until “Progress (0..1000)” shows 1000, then press ENTER to return to LOCAL BACKUP.

## 6.2.3.8.5 Save-Load USB Firmware Update

“System → Setup → Save-Load  
→ USB Firmware Update”



Firmware is the analyzer’s basic operational software. This menu enables to update your current analyzer firmware from an external USB device, e.g. to add new features, etc.

After selecting the firmware update procedure, a safety prompt appears: select “Yes!” to start the procedure; “No!” to cancel.

Firmware USB update procedure:

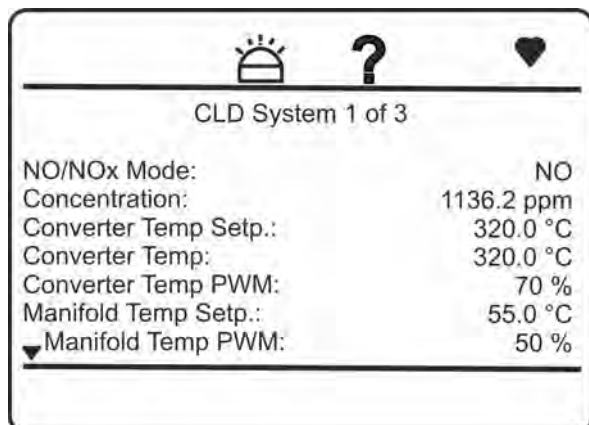
- The USB device is checked for the directory *emerson\_xe/[serial number]/firmware/program*. If present, the files within this directory are copied to the internal SD card. If not present, the USB device in the given order is scanned for the following directories to contain valid firmware data:
  - *emerson\_xe/upgrade/firmware/program*
  - *emerson\_xe/[serial number]/firmware/web*
  - *emerson\_xe/upgrade/firmware/web*.

The first found valid data are copied to the internal SD card.

- After the files are copied to the SD card, the analyzer reboots.
- After the reboot, the analyzer configuration files are copied to the SD card.
- Now, the firmware files are copied to their final destination.
- Configuration files are restored from the SD card.
- All passwords are reset to factory defaults.
- A final analyzer reboot completes the update procedure.

## 6.2.3.9 CLD System

*“System → Setup → CLD System”*



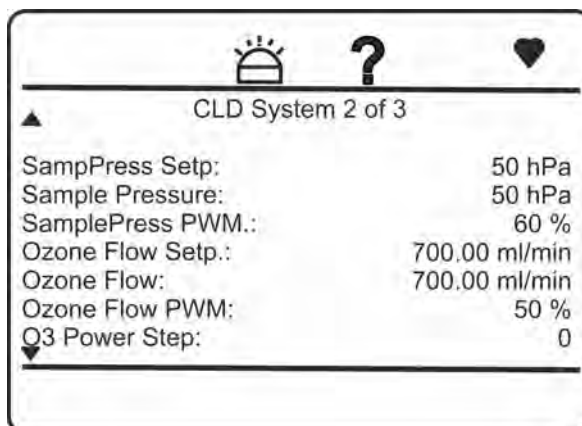
CLD System 1 of 3	
NO/NO <sub>x</sub> Mode:	NO
Concentration:	1136.2 ppm
Converter Temp Setp.:	320.0 °C
Converter Temp:	320.0 °C
Converter Temp PWM:	70 %
Manifold Temp Setp.:	55.0 °C
Manifold Temp PWM:	50 %

*“Converter Temperature Setpoint”* and *“NO/NO<sub>x</sub> Mode”* are editable.

All other values are non-editable, read-only live values.

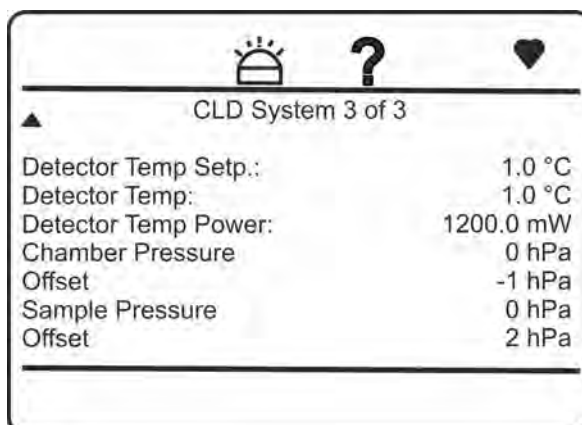
- *“NO/NO<sub>x</sub> Mode”*: Allows to switch between NO/NO<sub>x</sub> measuring mode.
- *“Concentration”*: Shows the current concentration live value.
- *“Converter Temp Setp.”*: Setpoint of converter heater.

- *“Converter Temp”*: Measured converter temperature.
- *“Converter Temp PWM”*: Converter heater control.
- *“Manifold Temp Setp.”*: Setpoint of manifold heater.
- *“Manifold Temp”*: Measured manifold temperature.
- *“Manifold Temp PWM”*: Manifold heater control.



CLD System 2 of 3	
SampPress Setp:	50 hPa
Sample Pressure:	50 hPa
SamplePress PWM:	60 %
Ozone Flow Setp.:	700.00 ml/min
Ozone Flow:	700.00 ml/min
Ozone Flow PWM:	50 %
O3 Power Step:	0

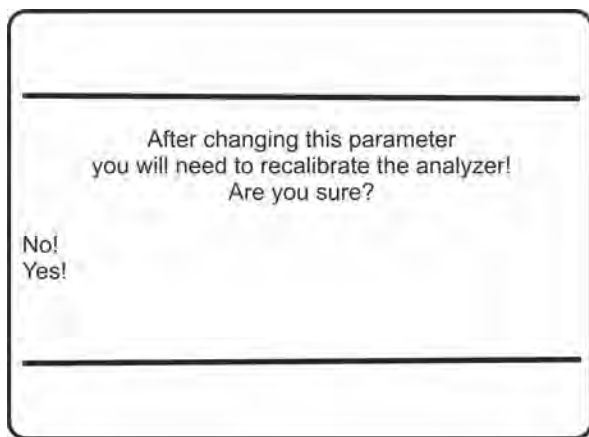
- *“SampPress Setp.”*: Setpoint of sample pressure control.
- *“Sample Pressure”*: Measured sample pressure.
- *“SamplePress PWM”*: Sample pressure control.
- *“Ozone Flow Setp.”*: Setpoint of ozone flow control.
- *“Ozone Flow”*: Measured ozone flow.
- *“Ozone Flow PWM”*: Ozone flow control.
- *“O3 Power Step”*: Power step of ozone generator.



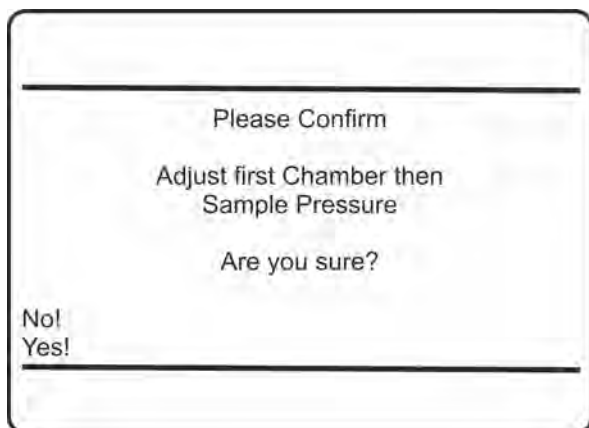
CLD System 3 of 3	
Detector Temp Setp.:	1.0 °C
Detector Temp:	1.0 °C
Detector Temp Power:	1200.0 mW
Chamber Pressure	0 hPa
Offset	-1 hPa
Sample Pressure	0 hPa
Offset	2 hPa



- **"Detector Temp Setp.":** Temperature setpoint of TEC.
- **"Detector Temp":** Measured detector temperature.
- **"Detector Temp Power":** TEC power.
- **"Chamber Pressure":** Measured chamber pressure.
- **"Offset":** Zero offset to fine adjust chamber pressure.
- **"Sample Pressure":** Measured sample pressure.
- **"Offset":** Zero offset to fine adjust sample pressure.



To ensure the user is aware of the changes on the 'Converter Temperature' parameter, a confirmation pop-up message shall appear. The changed values shall be confirmed, otherwise all changes will be discarded.



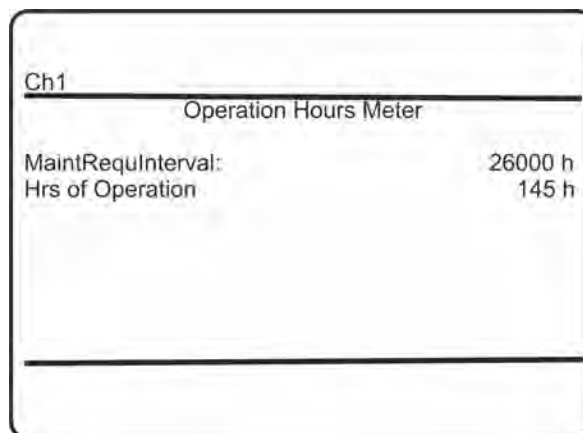
To ensure the user is aware of the changes on either one of the offset parameters, a pop-up message appears requesting confirmation. It reminds the user to first adjust the chamber pressure offset before changing the sample pressure offset as described (Chapter 9.10 "Fine Adjusting Pressure Measurements" on page 188). The changed values shall be confirmed, otherwise all changes will be discarded.

## 6.2.3.10 Set up Operation Hours Meter

**"System → Setup → Operation Hours Meter"**

This menu allows to specify intervals for maintenance tasks.

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



- **"MaintRequInterval":** Enter the operating hours for the maintenance requests interval. Accepted range:  
– 0 ... 26280 hrs.



**Note!** Enter 0 to disable operation hours monitoring.

- **"Hrs of Operation":** Operating hours since last reset.





If this function is enabled, a maintenance request is triggered the moment "Hrs of Operation" matches "MaintRequInterval". To reset this message, activate "Reset Hours".

- "Reset Hours!": Press ENTER in this line to reset the operating hours meter.

### 6.2.3.11 Set up Identification

"System → Setup → Identification"

This menu allows to enter analyzer identification data to identify the analyzer within a network.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



Identification	
System Tag:	Device tag
Plant Name:	Plant name
Customer:	Company name
Component Tags..	

- "System Tag": Enter a device tag here to identify the analyzer in e.g. a network.
- "Plant Name" and "Customer": Enter a plant and customer name here.
- "Component Tags..": Enter tags for components.

#### 6.2.3.11.1 Component Tag Setup Menu

"System → Setup → Identification  
→ Component Tags"



Ch1	Tags
Tag:	Ch1
Range1 Tag:	Ch1-R1
Range2 Tag:	Ch1-R2
Range3 Tag:	Ch1-R3
Range4 Tag:	Ch1-R4

- Within this menu, you may configure the component's tag, and individual tags for each range.

Accepted entries:

- alphanumeric text, up to eight characters long.



If set, the "Tag" always appears in the very top menu line if the current menu refers to the component.

### 6.2.3.12 Set up Time

"System → Setup → Time"

This menu allows to configure time settings.



Correct time settings are important for e.g. time interval based calibrations, validation and log files entries.

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



Time	
Time Source:	Manual
NTP Server..	
Manual Time..	
Time	7/7/2009 10:27

- **"Time Source"**: Select how the analyzer time is set.  
Available options:  
– Manual  
– NTP
- **"NTP Server.."**: Configure an NTP time server.
- **"Manual Time.."**: Enter this menu to set up the analyzer time manually.
- **"Time"**: The last line shows the current analyzer time.



Time format is 24h (13 = 1 pm)

## 6.2.3.12.1 Set up NTP Server

**"System → Setup → Time → NTP Server"**

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



NTP Server	
NTP Server:	194.25.134.196
Time Zone:	1 h
Time Zone:	0 h
Sync Time:	No
Sync Hour:	1 h
Synchronize Now!	
Time	11/22/2015 09:55

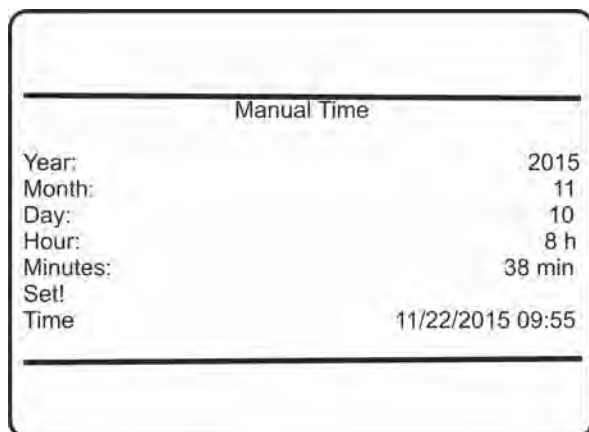
- **"NTP Server"**: Enter the IP address of the NTP server.  
There are many NTP servers available on the internet. Visit [www.ntp.org](http://www.ntp.org) for the IP address of a NTP server.
- **"Time Zone"**: Enter the hours offset of the local area to the GMT.
- **"Time Zone"**: Enter the minutes offset of the local area to the GMT.
- **"Sync Time"**: Choose "yes" to activate the synchronization of the gas analyzer time with the NTP server.
- **"Sync Hour"**: Enter the time of the day in which the gas analyzer should be synchronized with the NTP server time.
- **"Synchronize Now!"**: Synchronize the gas analyzer time with the NTP server time.
- **"Time"**: Shows the current time.

## 6.2.3.12.2 Set up Manual Time

**"System → Setup → Time → Manual Time"**

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



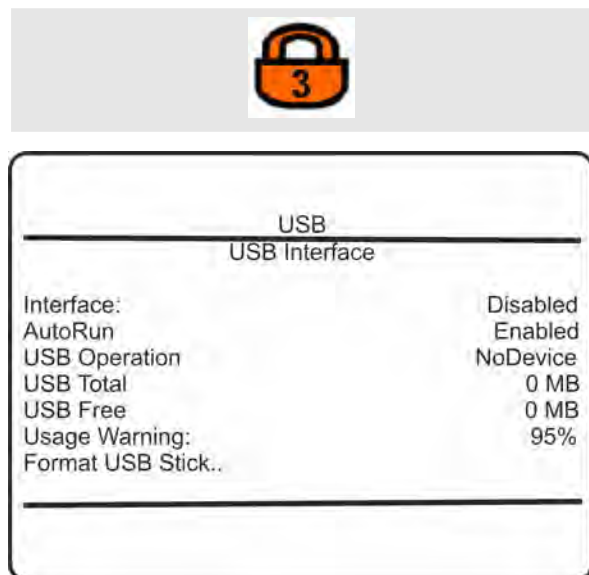


- "Year": Enter the year.
- "Month": Enter the month.
- "Day": Enter the day.
- "Hour": Enter the hour.
- "Minutes": Enter the minutes.
- "Set!": Set the time.
- "Time": Shows the current time.

## 6.2.3.13 Set up USB Interface

"System → Setup → USB Interface"

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.

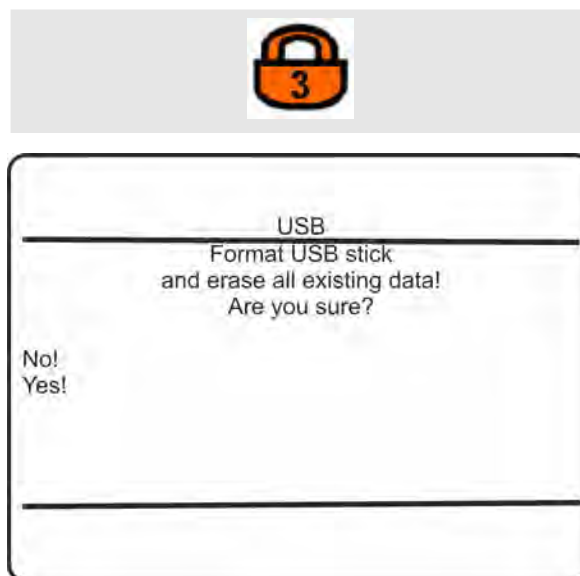


- USB: Indicator for a connected USB device.
- If "Interface" is set to Enabled, this menu shows status USB information:

- MassMemory if a memory stick is connected.
- Formatting if formatting a device is ongoing.
- NoDevice if no device is connected.
- If "Interface" is set to Disabled, the line shows Disabled also.
- If "AutoRun" is Enabled and a USB device with a software update is connected, then the system is updated automatically.
- "USB Total" and "USB Free": USB stick memory information (if a device is connected).
- "Usage Warning": Specify the usage limit for the USB stick to give a warning.
- "Format USB Stick..": Format a USB memory stick before using it with this analyzer.

### 6.2.3.13.1 Format USB Stick

"System → Setup → USB Interface  
→ Format USB Interface"



- Select "Yes!" to start formatting.
- A progress screen appears. Formatting has ended when "Busy" in this screen shows 0.



*While formatting is in progress, "USB operation" in the previous menu shows formatting. **Do not remove a device while formatting!** This may cause loss of data or abnormal behavior of the instrument!*

Formatting creates a basic file system structure on the stick:

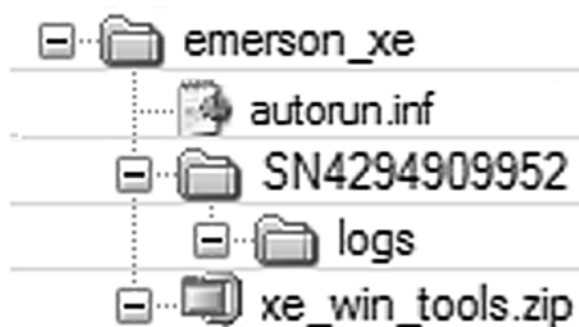


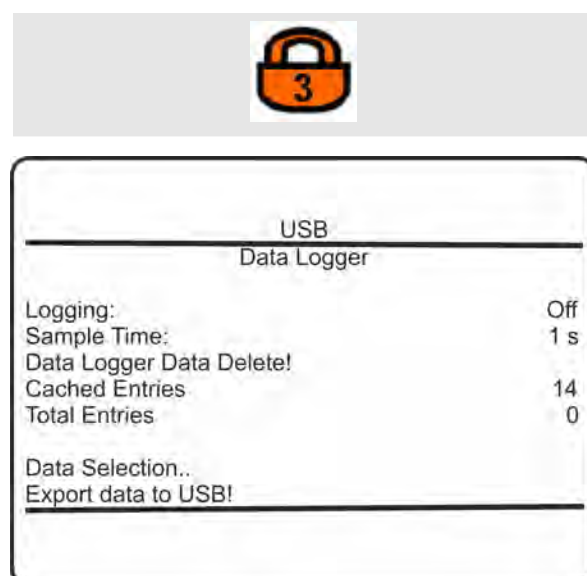
Fig. 63: USB File System Structure

- “emerson\_xe”: Directory within the root.
- “autorun.inf”: File to automatically run functions when connecting the stick to an analyzer.
- “SN4294909952”: 'Serial number directory' beginning with 'SN' followed by the analyzer's numeric serial number.
- “logs”: Directory to hold the log files, copied to the stick by "Export data to USB!" actions within logger menus. Files within this directory are specific only for the analyzer with the serial number of the parent directory.
- “xe\_win\_tools.zip”: File containing USB tools.

## 6.2.3.14 Set up Data Logger

“System → Setup → Data Logger”

If the system is set up correctly, the access code for Level 3 must be entered to gain access to this menu.



- “Logging”: Enable (On) or disable (Off) data logging.
- “Sample Time”: Specify data logging interval time.  
Accepted values:  
– 0 ... 30,000 s
- “Data Logger Data Delete!”: Delete current set of logged data.



*There is no undo for this procedure!*

- “Cached Entries”: Number of records currently in RAM, not yet saved to the internal data logger file.  
Data is written to the internal file every 30 min, or the moment, "Logging" is turned Off.
- “Total Entries”: Total number of records in the internal data logger file.
- “Data Selection..”: Setup data logger export options.
- “Export data to USB!”: Export logged data to a USB device.

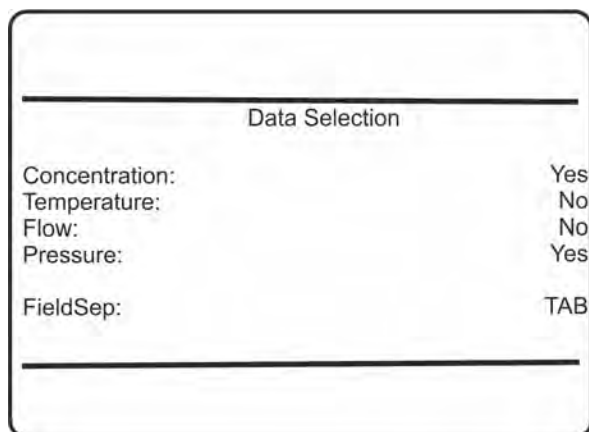


*Make sure, there's a memory device connected! If not yet present, the structure as shown in Chapter 6.2.3.13.1 “Format USB Stick” on page 146 is created on the stick, without formatting. The log files can be found within the 'logs' directory.*

### 6.2.3.14.1 Set up Data Logger Data Selection

“System → Setup → Data Logger → Data Selection”





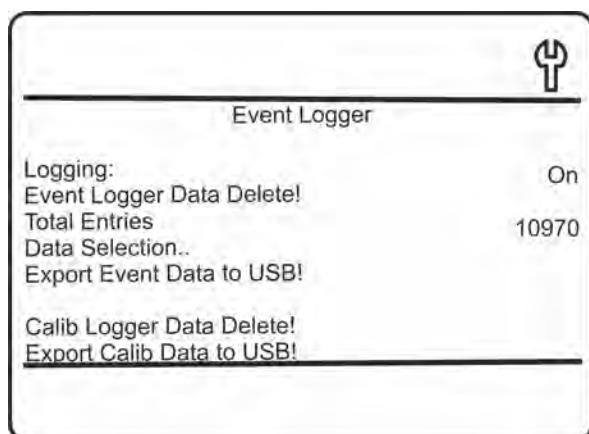
The screenshot shows a menu titled "Data Selection". It contains five options, each with a corresponding status on the right:

Option	Status
Concentration:	Yes
Temperature:	No
Flow:	No
Pressure:	Yes
FieldSep:	TAB

- **"Concentration", "Temperature", "Flow", "Pressure":** Specify which data to be exported.  
Available options:
  - Yes
  - No
- **"FieldSep":** Select the field separator, separating the different data columns in the exported text file.  
Available options:
  - TAB
  - Semikol
  - Comma

### 6.2.3.15 Set up Event Logger

"System → Setup → Event Logger"



The screenshot shows a menu titled "Event Logger" with a key icon in the top right corner. It contains several options:

- Logging: On
- Event Logger Data Delete!
- Total Entries 10970
- Data Selection..
- Export Event Data to USB!
- Calib Logger Data Delete!
- Export Calib Data to USB!

- **"Logging":** De-activate event logging.  
Available options:
  - On
  - Off
- **"Event Logger Data Delete!":** Delete event logger data.



*There is no undo for this procedure!*

- **"Total Entries":** Total entries of the event logger.
- **"Data Selection..":** Opens data selection sub menu.
- **"Export Event Data to USB!":** Export event logger data to USB stick.



*Make sure, there's a memory device connected! Before the data is exported, all "Cached entries" are copied to the "Total entries" file.*

- **"Calib Logger Data Delete!":** Delete calibration logger data.



*There is no undo for this procedure!*

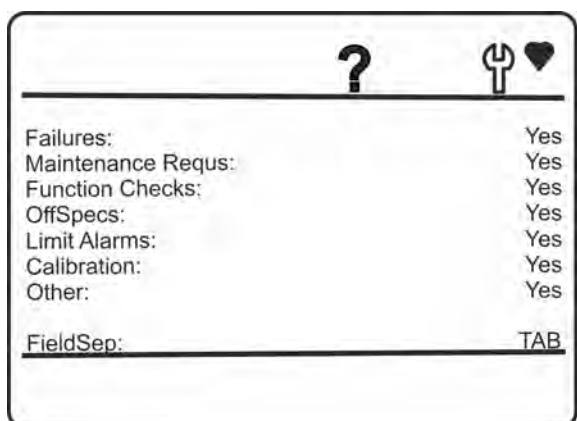
- **"Export Calib Data to USB!":** Export calib data to USB.



*Make sure, there's a memory device connected! Before the data is exported, all "Cached entries" are copied to the "Total entries" file.*

#### 6.2.3.15.1 Set up Data Selection

"System → Setup → Event Logger  
→ Data Selection"



- This menu allows to specify the events which should be logged.  
Available options:
  - Yes
  - No
- “FieldSep”: Select the field separator.

## 6.2.3.16 Set up PLC



*It is recommended to setup the PLC via Webbrowser access and not via the LOI. This is much more convenient and certain functions like actual programming are only available in the webbrowser..*

## 6.2.3.17 Set up Calculator



*It is recommended to setup the calculators via Webbrowser access and not via the LOI. This is much more convenient and certain functions like actual programming are only available in the webbrowser.*

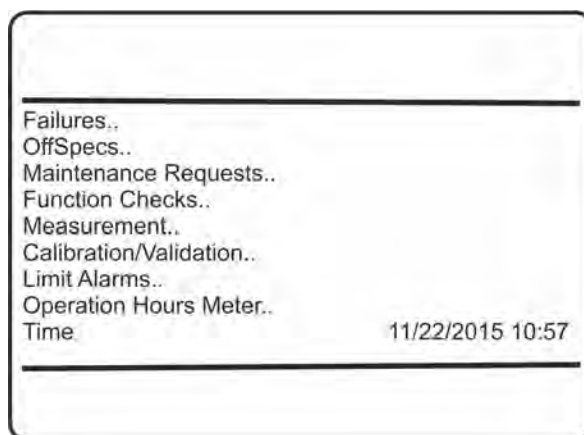
## 6.2.4 Status Menu

“System → Status”

This menu allows to open any submenu to see detailed information about related status.



*Lines 1 to 4 confirm to NAMUR states. If no status of a specific type is active (no message to show), the related menu line is hidden.*

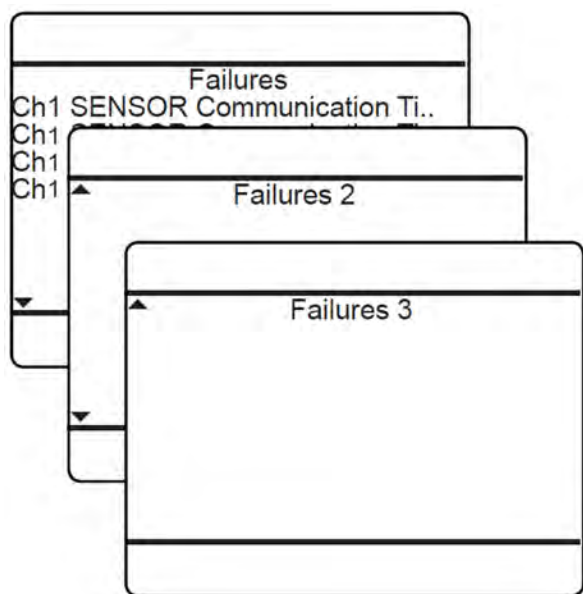


- “Failures..”: Failure status information.
- “OffSpecs..”: Off-specs status information.
- “Maintenance Requests..”: Maintenance request status information.
- “Function Checks..”: Function checks status information.
- “Measurement..”: Measurement status information.
- “Calibration/Validation..”: Calibration and validation status information.
- “Limit Alarms..”: Limit Alarms status information.
- “Operation Hours Meter..”: Operation hours information.
- “Time”: Current date and time.

### 6.2.4.1 Status Menu Failures

“System → Status → Failures”





Up to three menu pages are prepared to show status messages of type “Failure”.



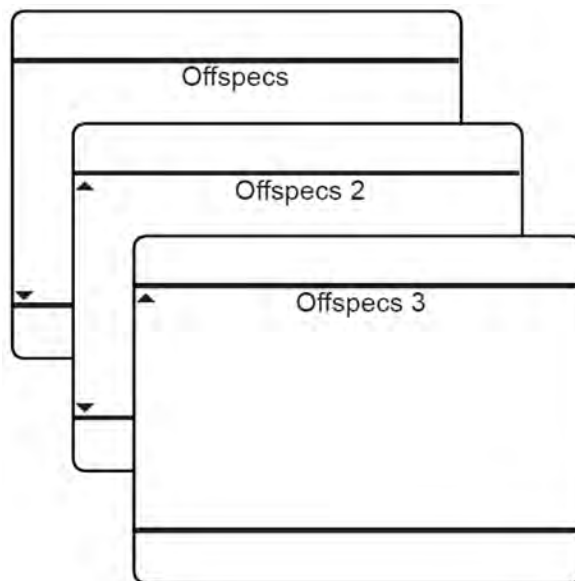
*If no failure is active (no message to show), this menu is hidden.*

Messages starting with 'Ch1' are channel related, while all others are analyzer related.

For a detailed description of messages, hints on causes of failures and recommended actions see [Chapter 11 “Troubleshooting”](#) on page 212.

## 6.2.4.2 Status Menu Off-Specs

“System → Status → OffSpecs”



Up to three menu pages are prepared to show status messages of type “Off-specs”.



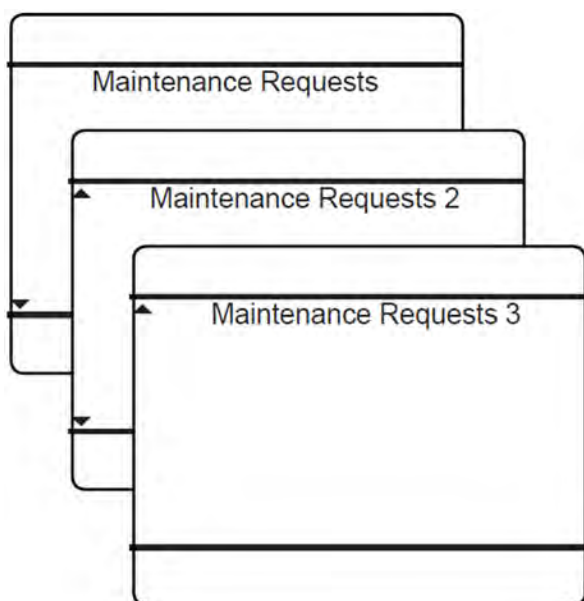
*If no off-spec is active (no message to show), this menu is hidden.*

Messages starting with 'Ch1' are channel related, while all others are analyzer related.

For a detailed description of messages, hints on causes of off-specs and recommended actions see [Chapter 11 “Troubleshooting”](#) on page 212.

## 6.2.4.3 Status Menu Maintenance Requests

“System → Status → Maintenance Requests”



Up to three menu pages are prepared to show status messages of type "Maintenance requests".



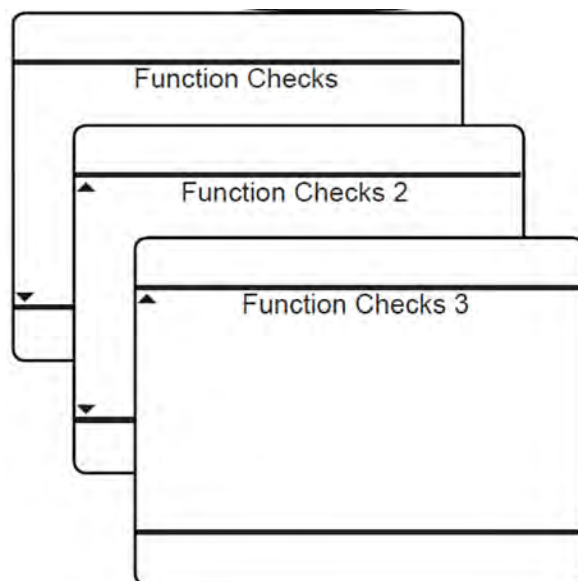
*If no maintenance request is active (no message to show), this menu is hidden.*

Messages starting with 'Ch1' are channel related, while all others are analyzer related.

For a detailed description of messages, hints on causes of maintenance requests and recommended actions see [Chapter 11 "Troubleshooting"](#) on page 212.

## 6.2.4.4 Status Menu Function Checks

"System → Status → Function Checks"



Up to three menu pages are prepared to show status messages of type "Function check".



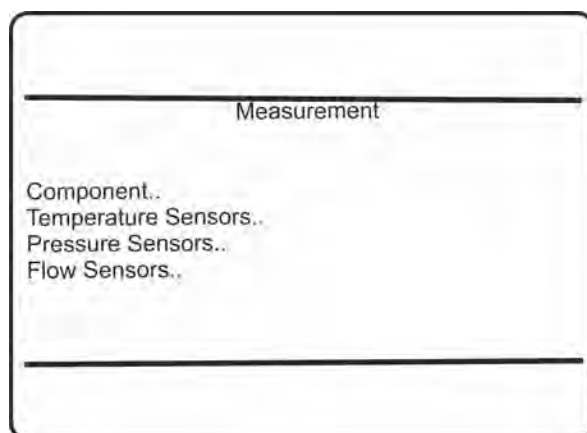
*If no function check is active (no message to show), this menu is hidden.*

Messages starting with 'Ch1' are channel related, while all others are analyzer related.

For a detailed description of messages, hints on causes of function check and recommended actions see [Chapter 11 "Troubleshooting"](#) on page 212.

## 6.2.4.5 Status Menu Measurement

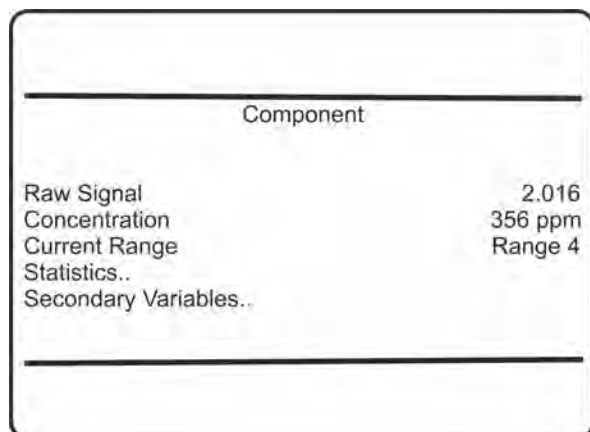
"System → Status → Measurement"



- *“Component..”*: View status information on the component.
- *“Temperature Sensors..”*: View status information on temperature sensors.
- *“Pressure Sensors..”*: View status information on pressure sensors.
- *“Flow Sensors..”*: View status information on flow sensors.

## 6.2.4.5.1 Status Menu Component

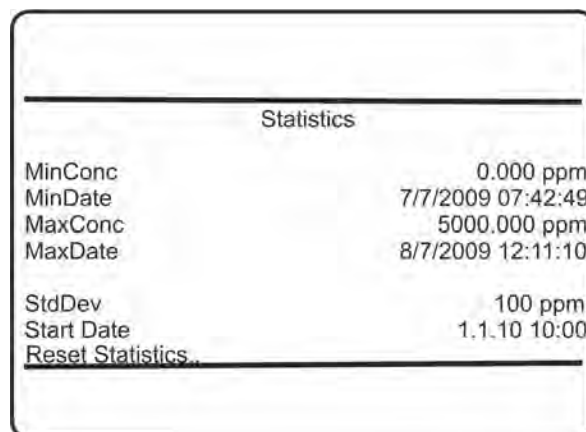
*“System → Status → Measurement → Component”*



- *“Statistics..”*: Opens the submenu with measurement statistics.
- *“Secondary Variables..”*: Opens the submenu with information on secondary variables (pressure, flow, ...).

## 6.2.4.5.2 Status Menu Component Statistics

*“System → Status → Measurement → Component → Statistics”*



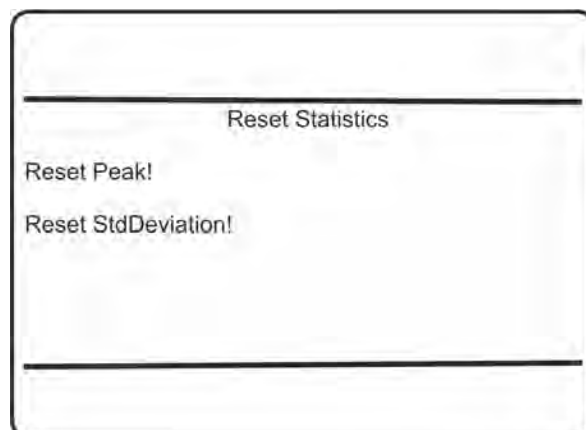
This menu page provides some statistical data for the component:

- *“MinConc”, “MinDate”, “MaxConc”, “MaxDate”*: Minimum and maximum measured concentrations, and the related date.
- *“StdDev”* and *“Start Date”*: Standard deviation of measured concentrations, and date when calculation started.
- *“Reset Statistics..”*: To reset statistics, see below.

## 6.2.4.5.3 Status Menu Reset Statistics

*“System → Status → Measurement → Component → Reset Statistics”*

If the system is set up correctly, the access code for Level 2 must be entered to gain access to this menu.



- “Reset Peak!” and “Reset StdDeviation!”:  
Select which statistic to reset.



*There's no undo for these functions!*

## 6.2.4.5.4 Status Menu Secondary Variables

“System → Status → Measurement  
→ Component → Secondary Variables”

Secondary Variables 1 of 3	
Sample Pressure	255 hPa
SampPress Status	Good
Ozone Flow	600 ml/min
Ozone Flow Status	Good
O3 Power Step	6
Chamber Pressure	0 hPa
ChamPress Status	Good

Secondary Variables 2 of 3	
VentBackPress	1010 hPa
VentBackPress Status	Good
Baro Pressure	1010 hPa
BaroPress Status	Good
Converter Temp	340 °C
Converter Temp Status	Good
Manifold Temp	55 °C
Manifold Temp Status	Good

Secondary Variables 3 of 3	
Electronics Temp	30.1 °C
Electronics Temp Status	Good
Detector Temp	1 °C
Detector Temp Status	Good
TempZComp	30.1 °C
TempSComp	30.1 °C

This menu provides some secondary measurement data:

- Temperature, pressure and flow values.
- Reference temperature for temperature compensation, separately for zero and span.
- Status of the related sensors.  
Possible status values:
  - Good
  - Simulated
  - Failure
  - Absent

## 6.2.4.5.5 Status Menu Temperature Sensors

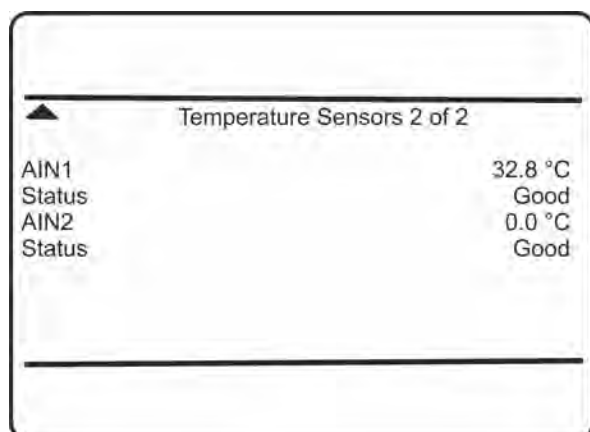
“System → Status → Measurement  
→ Temperature Sensors”

Secondary Variables 3 of 3	
CLD-Elct-T	30.1 °C
Status	Good
CLD-Mfld-T	55 °C
Status	Good
CLD-Conv-T	340 °C
Status	Good
CLD-Det1-T	1 °C
Status	Good

View data for all possibly installed temperature sensors, provided in two lines each.

Each first line shows the temperature sensor and the currently measured value, followed by a related line showing the sensor status:

- Sensor (possible values: CLD-Elct-T, CLD-Mfld-T, CLD-Conv-T, CLD-Det1-T, AIN1, AIN2) and current temperature.
- “Status”: Sensor status.  
Possible values:
  - Good
  - Simulated
  - Failure
  - Absent



The AIN1 and AIN2 analog inputs are shown for the case a temperature sensor is assigned to those.

#### 6.2.4.5.6 Status Menu Pressure Sensors

*“System → Status → Measurement → Pressure Sensors”*

This menu shows data for all possibly installed pressure sensors, provided in two lines each.

Each first line shows the pressure sensor and the currently measured value, followed by a related line showing the sensor status:

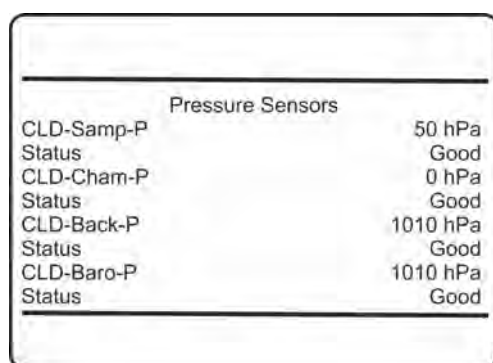


Fig. 64: Pressure Sensors

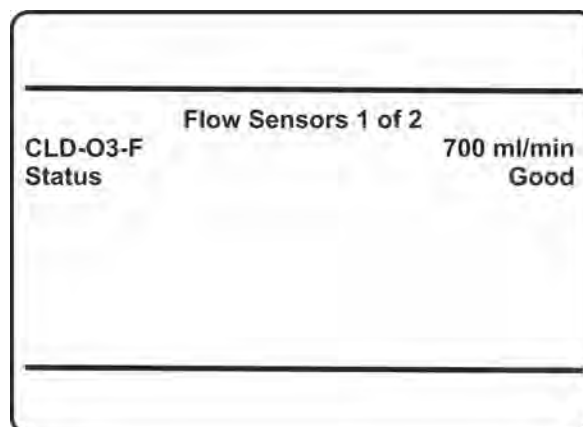
- Sensor (possible values: CLD-Samp-P, CLD-Cham-P, CLD-Back-P, CLD-Baro-P and current pressure.
- “Status”: Sensor status.  
Possible values:
  - Good
  - Simulated
  - Failure
  - Absent

#### 6.2.4.5.7 Status Menu Flow Sensors

*“System → Status → Measurement → Flow Sensors”*

This menu shows data for all possibly installed flow sensors, provided in two lines each.

Each first line shows the flow sensor and the currently measured value, followed by a related line showing the sensor status:

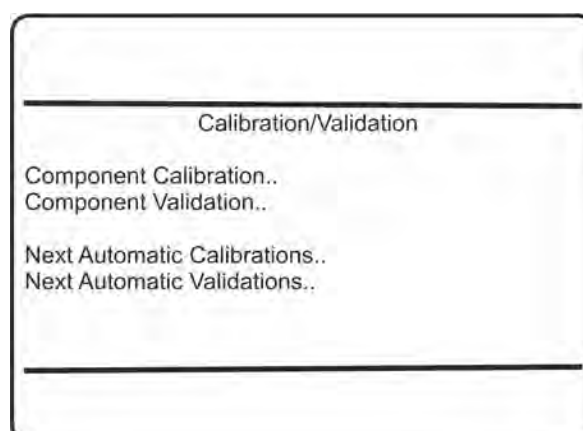


- Sensor (possible values: CLD-O3 and current flow.
- “Status”: Sensor status.  
Possible values:
  - Good
  - Simulated
  - Failure
  - Absent

#### 6.2.4.6 Status Menu Calibration/Validation

*“System → Status → Calibration/Validation”*

This menu allows to view calibration and validation status information.

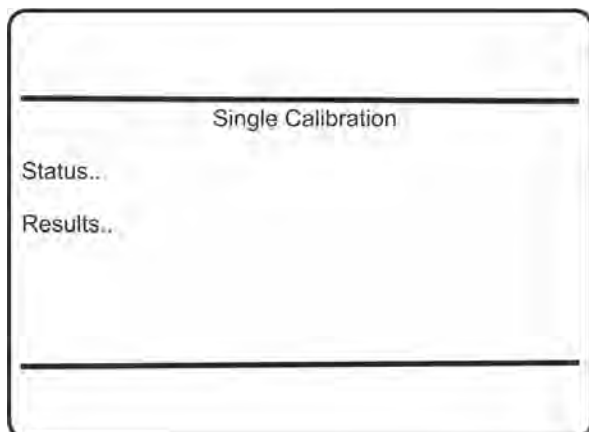




- “Component Calibration..”: View calibration data for the component.
- “Component Validation..”: View validation data for the component.
- “Next Automatic Calibrations..”: Enter this menu to view scheduled dates for the next automatically performed calibrations.
- “Next Automatic Validations..”: Enter this menu to view scheduled dates for the next automatically performed validations.

## 6.2.4.6.1 Status Calibration/Validation Component Calibration

“System → Status → Calibration/Validation → Component Calibration”



Single Calibration

Status..

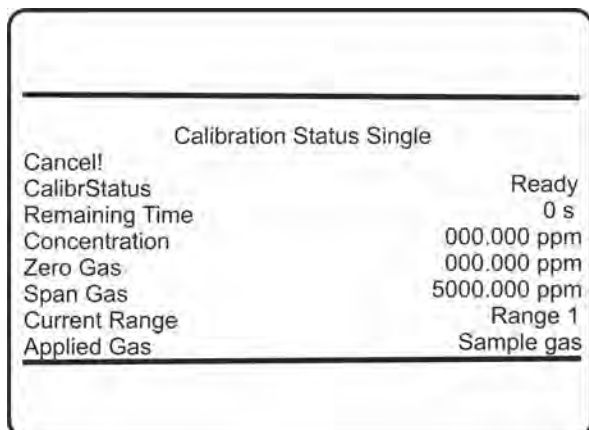
Results..

- “Status..”: View the calibration status.
- “Results..”: View the calibration results.

## 6.2.4.6.2 Calibration Status Single Menu

“System → Status → Calibration/Validation → Component Calibration → Status”

This menu provides calibration status information for the last calibration.



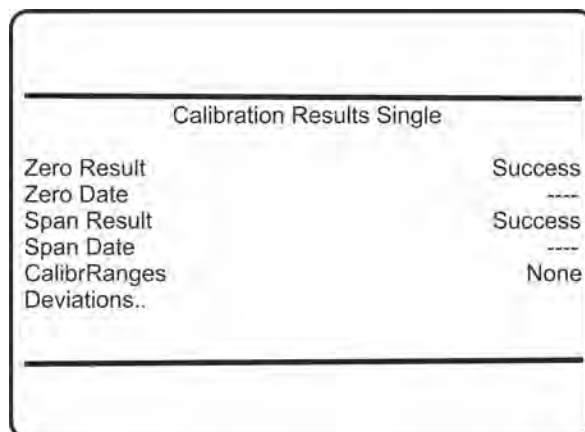
Calibration Status Single

Cancel!	Ready
CalibrStatus	0 s
Remaining Time	
Concentration	000.000 ppm
Zero Gas	000.000 ppm
Span Gas	5000.000 ppm
Current Range	Range 1
Applied Gas	Sample gas

## 6.2.4.6.3 Calibration Results Single Menu

“System → Status → Calibration/Validation → Component Calibration → Results”

This menu provides calibration results.



Calibration Results Single

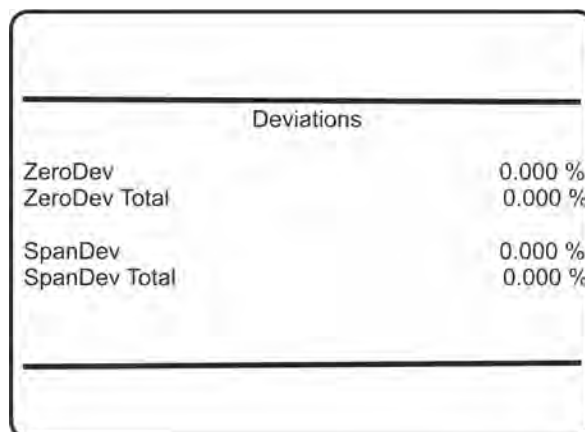
Zero Result	Success
Zero Date	----
Span Result	Success
Span Date	----
CalibrRanges	None
Deviations..	

- “Deviations..”: Calibration result deviations.

## 6.2.4.6.4 Calibration Results Single Deviations

“System → Status → Calibration/Validation → Component Calibration → Results → Deviations”

This menu provides information about calibration deviations.



Deviations

ZeroDev	0.000 %
ZeroDev Total	0.000 %
SpanDev	0.000 %
SpanDev Total	0.000 %

## 6.2.4.6.5 Status Calibration/Validation Component Validation

“System → Status → Calibration/Validation → Component Validation”



Single Validation	
Status..	
Results..	

- "Status..": View the validation status.
- "Results..": View the validation results.

#### 6.2.4.6.6 Validation Status Single Menu

"System → Status → Calibration/Validation  
→ Component Validation → Status"

This menu provides validation status information for the last validation.

Validation Status Single	
Validation Status	Ready
Remaining Time	0s
Concentration	2000.0 ppm
Zero Gas	0.0 ppm
Span Gas	2000.0 ppm
Current Range	Range 1
Applied Gas	Span gas

#### 6.2.4.6.7 Validation Results Single Menu

"System → Status → Calibration/Validation  
→ Component Validation → Results"

This menu provides validation results.

Validation Results Single	
Zero Result	Limit Exceeded
Zero Date	----
Span Result	Canceled
Span Date	----
ZeroValid Dev	0.0 ppm
SpanValid Dev	0.0 ppm

#### 6.2.4.6.8 Next Automatic Calibrations Menu

"System → Status → Calibration/Validation  
→ Next Automatic Calibrations"



This menu is accessible from STATUS - CALIBRATION/VALIDATION, and CONTROL - ADVANCED CALIBRATION.

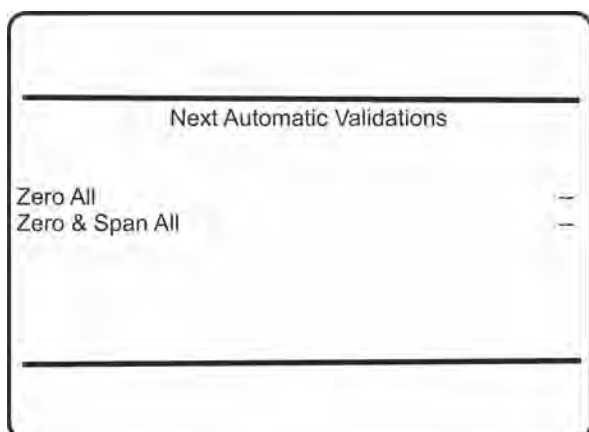
This menu provides information about scheduled automatic calibrations.

Next Automatic Calibrations	
Zero All	4/15/10 14:30
Zero & Span All	---
Progr. Sequence	---
Blowback All	---

#### 6.2.4.6.9 Next Automatic Validations Menu

"System → Status → Calibration/Validation  
→ Next Automatic Validations"

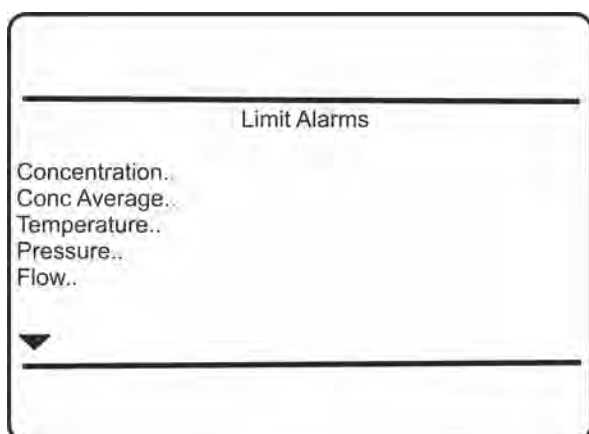
This menu provides information about scheduled automatic calibrations.



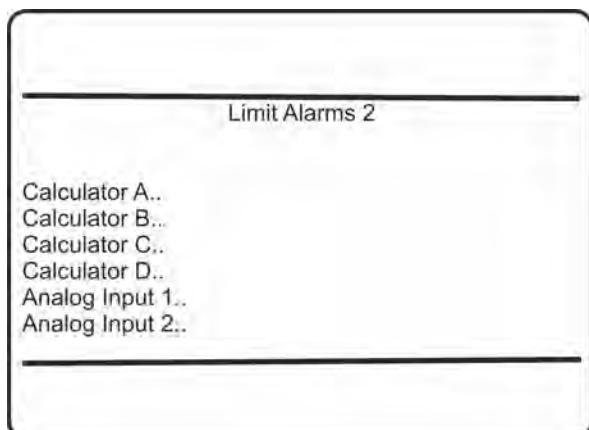
## 6.2.4.7 Status Menu Limit Alarms

*"System → Status → Limit Alarms"*

This menu allows to select from several alarm functions, to view detailed status information.



- The first menu page opens submenus for component related alarms.

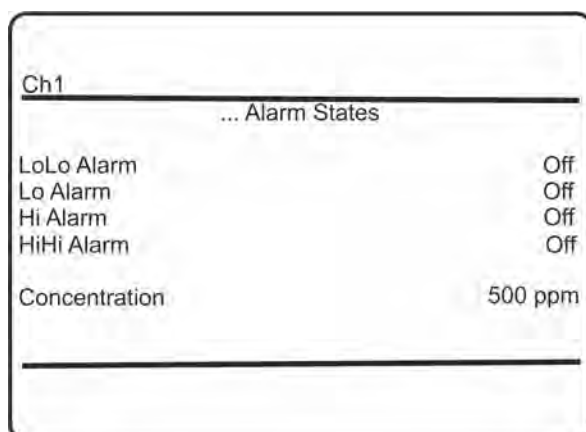


- The second menu page is available only if the calculator option has been installed, and then allows to view related alarm status information.

### 6.2.4.7.1 Alarms Status Details

*"System → Status → Limit Alarms"*

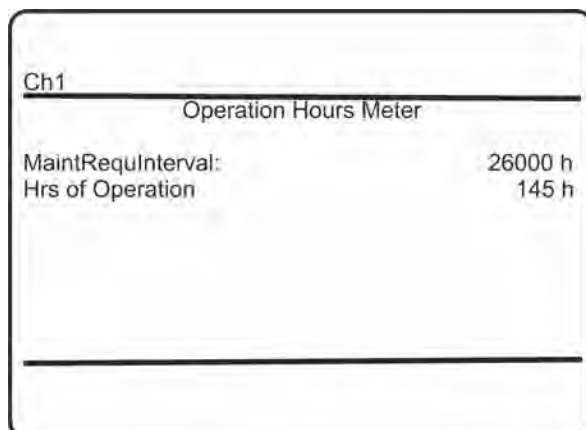
All alarm status menus, accessible from STATUS - LIMIT ALARMS (previous section), are designed in a similar way to provide the information.



- *"...Alarm States"*: '...' in the title is replaced by the text of the submenu line, selected in the previous menu, e.g. *"Concentration"*.
- *"LoLo Alarm"*, *"Lo Alarm"*, *"Hi Alarm"*, *"HiHi Alarm"*: These four menu lines show if alarms are activated (On), or not (Off).
- *"Concentration"*: Shows the current value for the selected function, e.g. the currently measured concentration.

### 6.2.4.8 Operation Hours Status

*"System → Status → Operation Hours Meter"*



### 6.2.5 Info Menu

*"System → Info"*

This menu allows to view the most important information about your instrument at a glance.

Info	
Firmware	1.7.0
CLD Boards..	
Serial No	XEK0920339948
Components..	
Installed Options..	
Ethernet1 IP	129.76.68.23
Ethernet2 IP	192.168.1.87
▼Time	01/30/19 14:00

- *"CLD Boards.."*: Enter this submenu to view the firmware version strings of the CLD specific submodules.
- *"Components.."*: Enter this submenu to see how many measuring channels are installed. For the XECLD there is only one channel.
- *"Installed Options.."*: Enter this submenu to view information about installed options.

▲ Data Logger	Off
Event Logger	Off
PLC Enabled	Yes
Calculator Enabled	No
Identification..	
LOI Firmware	V1.00 12.02.10
Phrase	Version EN 1.09
Time	01/30/19 10:00

- *"Identification.."*: Enter this submenu to see how the analyzer is identified, e.g. in a network.

#### 6.2.5.1 Info Menu Components

*"System → Info → Components"*

Only measuring channels indicating 'Enabled' are installed in the current analyzer. For the XECLD, only Channel 1 is enabled.

Components	
Channel1	Enabled
Channel2	Disabled
Channel3	Disabled
Channel4	Disabled
Channel5	Disabled
Measurement..	

- *"Measurement.."*: See below for the measurement info menu.

#### 6.2.5.2 Info Menu Measurements

*"System → Info → Components → Measurement"*

This menu shows the full scale limits.

Measurement	
RangeAbsMin	-10000 ppm
RangeAbsMax	10000000 ppm

#### 6.2.5.3 Info Menu Installed Options

*"System → Info → Installed Options"*

This menu indicates, if your analyzer features any of the listed options.

Installed Options	
Package	None
Valves	None
Pump	None
DIO#1 Installed	Yes
DIO#2 Installed	No
Anal. Outputs	4
AIN Installed	No

“Package”: Refers to the software upgrade options.

## 6.2.5.4 Info Menu Identification

“System → Info → Identification”

Discover how the instrument is identified.

Identification	
System Tag:	Device tag
Plant Name:	Plant name
Customer:	Company name
Component Tags,,	

## 6.2.5.5 Info Menu Component Tags

“System → Info → Identification  
→ Component Tags”

View channel and range tags.

Tags	
Tag	Ch1
Range1 Tag	Ch1-R1
Range2 Tag	Ch-R2
Range3 Tag	Ch-R3
Range4 Tag	Ch-R4

## 6.2.5.6 Info Menu CLD Boards

“System → Info → CLD Boards”

Firmware CLD Boards	
CPB Main FW	V1.0.0 01.01.2000
CPB Ctrl FW	V1.0.0 01.01.2000
CPA FW	V1.0.0 01.01.2000
CO3 FW	V1.0.0 01.01.2000

This menu page contains the firmware version strings of the CLD specific submodules (XMCPB Main, XMCPB Ctrl, XMCPA, XMCO3).

## 6.2.6 Service Menu

Service
Europe..
Americas..
Middle East & Africa..
Asia Pacific..
Factory Setup,,

This menu provides contact information about Emerson Process Management offices in several world regions (see below).



- *“Factory Setup..”*: The factory setup menu is protected by access level 4 code, and intended to be used by special trained personnel (Emerson Process Management service) only.

Europe
Emerson Process Management GmbH & Co. OHG Industriestr. 1 D-63594 Hasselroth Germany T +49(6055) 884-0

Service information (see analyzer or contact your sales office for latest data).

## 7 Installation

### 7.1 Safety on Installation

#### Improper Installation



#### **WARNING!**

#### **Danger of incorrect measurements due to improper installation!**

If the Analyzer is installed improperly, this may result in incorrect measurements. If decisions are made based on incorrect measurements people or the environment may get harmed.

- Install Analyzer only as described in this manual.
- Only install when all following requirements are met.

- For rackmount operation, the rack mount brackets must be installed. Housing feet must not be installed.
- For table top operation, housing feet must be installed. Rack mount brackets must not be installed.

#### **Location Requirements**

Before installing the Analyzer assure the following prerequisites considering the location of installation:

- On-site gas line connectors match the connectors of the Analyzer.
- Sample gas and air inputs meet the requirements stated in this manual ↗ *Chapter 3.1.4 “Gas Supply Data” on page 46.*
- Calibration gas with a defined concentration of nitric oxide (NO) must be available.
- An inert gas supply (e. g. N<sub>2</sub> or HE) must be available.
- Ventilation is sufficient to meet all local requirements.
- On-site power grid must provide protective earth connection including the possibility of electrical equipotential bonding.
- Location of operation must be protected from vibrations.

### 7.2 Assembly, Location and Mounting Requirements

#### Hindered Access to Disconnecting Devices



#### **WARNING!**

#### **Danger due to hindered access to disconnecting devices!**

If the Analyzer Module is placed so that it is difficult to operate disconnecting devices (such as main switches, Emergency stops or external fuses), fatal electrical shocks may be the consequence.

- Never place the Analyzer in a location where it might prevent easy access to any existing on-site disconnecting device.

#### **Mounting Requirements**

Before mounting the Analyzer, make sure the following mounting requirements are met:

- Mounting rack is able to carry the weight of the Analyzer ↗ *Chapter 3.1.1 “Housing Data” on page 43.*
- Mounting rack can meet the specified ventilation requirements. ↗ *“Room Ventilation Requirements” on page 50.*
- Mounting rack provides guiding rails to support the analyzer.
- Electromagnetic fields at the mounting position do not exceed the values stated in EN 61000-4-3 for industrial environments.
- Disconnecting devices (e. g. Main switches or emergency stops) must still be accessible after installing the Analyzer.
- Mounting location must be protected from vibrations

#### **Assembly Requirements**

Before installing the Analyzer assure the following requirements considering the assembly are met:

- All equipment is undamaged and complete.
- Device is prepared for the designated mode of operation.



## 7.3 Transport

### High Weight



#### **WARNING!**

#### **Risk of back injuries or skeletal systems injuries!**

The packed Analyzer weighs approx. 16 kg (35.3 lb). The unpacked Analyzer weighs approx. 12 kg (25.5 lb). If lifted by hand this may cause injuries especially on your lower back.

- Only lift the Analyzer according to local regulations.
- Use technical lifting assistance if necessary.
- Do not lift Analyzer if you should not lift the stated weights e. g. for medical reasons.

### Fragile Analyzer



#### **NOTICE!**

#### **Risk of damaged Analyzer due to improper handling during transport!**

If the Analyzer is thrown, dropped, bumped or exposed to vibrations while in transit it may be damaged. The rack mount brackets are not designed for lifting the Analyzer and may break on trying.

- Never throw, drop or bump Analyzer.
- Do not expose the unpacked Analyzer to vibrations.
- Never lift Analyzer using rack mount brackets only.
- Handle Analyzer with care.

## 7.4 Unpacking

### 7.4.1 Scope of Delivery

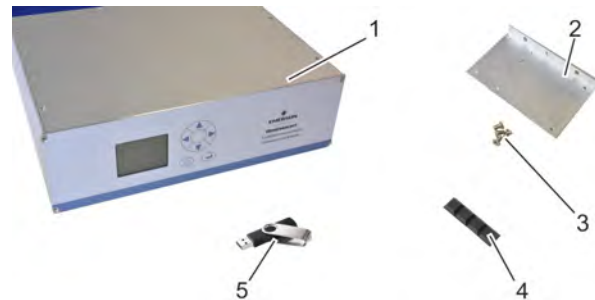


Fig. 65: Scope of delivery

- 1 Analyzer
- 2 Rack mount brackets
- 3 Fastening screws
- 4 Housing feet (4 x)
- 5 USB drive
- Housing filter
- This manual

On receipt, you will find a selection of components as shown in Fig. 65. The content of your delivery is specified on your delivery note.



*Check delivery note for a brief description of the listed components.*

### Transport Inspection

#### **Personnel:**

- Laboratory researchers
- System integrator
- On-site service technician

#### **Protective equipment:**

- Safety gloves
- Safety shoes

1. ➤ Compare the contents of your package with the entries on your delivery note.
2. ➤ Check each component for visible damage.
3. ➤ If all components listed on your delivery note are complete and undamaged, proceed with assembly ➤ *Chapter 7.5 "Mechanical installation" on page 163.*
4. ➤ If any components are missing or damaged, please contact Emerson customer service ➤ *Chapter 12.1 "Customer Service" on page 214.*

## 7.4.2 Disposing of Packaging

### Mind the Environment



#### ENVIRONMENT

#### Harm to environment by inappropriate disposal!

If packaging is disposed of against local regulations the environment may be harmed. Additionally, packaging materials are valuable resources that should not be wasted, but recycled.

- Always dispose of packaging material according to local regulations.

## 7.5 Mechanical installation

### Table Top or Rack Mount

The Analyzer may be operated as a table top device or using a mounting rack. Only one of these setups is to be used at a time. In order to swap between these setups, rack mount brackets or housing feet must be removed.

The mechanical installation differs depending on the desired operating position:

- Rack mount: ↗ Chapter 7.5.1 “Connecting Rack Mount Brackets” on page 163
- Table top: ↗ Chapter 7.5.2 “Connecting Housing Feet” on page 164

### Electrical Connection and Rack Mount Operation



*When operating the Analyzer as a rack mount device, it may be easier to first connect gas and power lines and after that inserting it into the mounting rack. If the designated mounting rack is not accessible from the rear side you should establish electrical connection first ↗ Chapter 7.8 “Establishing Electrical Connection” on page 166.*

## 7.5.1 Connecting Rack Mount Brackets

### Personnel:

- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

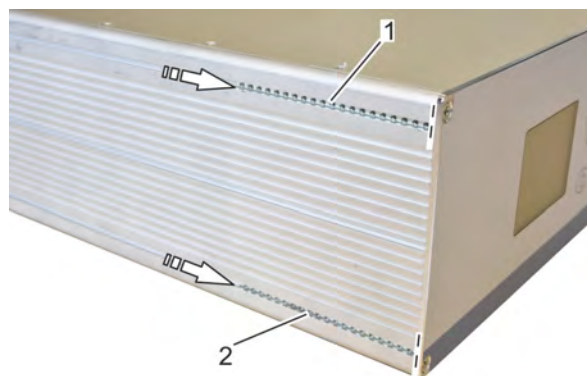


Fig. 66: Positioning rails

1. ➤ Make sure, no housing feet are fastened to the bottom plate.
2. ➤ Move both rails (Fig. 66/1 + 2) on one side fully towards the front panel.
3. ➤ Align front face of the bracket with the Analyzer's front panel.
4. ➤ Align thread of the upper rail and through-hole of the bracket using a small screwdriver.



Fig. 67: Fastening screws

5. ➤ Insert and fasten two screws at the upper rail.
6. ➤ Align lower rail with through-hole of the bracket.
7. ➤ Insert and fasten two screws on the lower rail.

- ⇒ One bracket is fastened to the housing and its front face and the front panel are aligned.

**8.** ➤ Repeat steps 3 to 6 on the other side of the housing.

- ⇒ Both brackets are fastened to the housing and their front faces and the front panel are aligned. The brackets may now function as an end-stop when inserting the housing into the mounting rack.

**9.** ➤ Make sure there is at least one unoccupied Rack Unit (RU) above and underneath the designated mounting location.

**10.** ➤ Insert Analyzer and push it all the way to the end-stop.

**11.** ➤ Fasten the rack mount brackets to the mounting rack.

## 7.5.2 Connecting Housing Feet

### ! NOTICE!

Avoid scratches by placing the Analyzer on a piece of cardboard or a rug!

### Personnel:

- On-site service technician

### Protective equipment:

- Safety gloves

**1.** ➤



### CAUTION!

**Wear gloves when removing rack mount brackets!**

If rack mount brackets are still mounted, remove them by unscrewing the fastening screws. Rails can remain inside the slots.

**2.** ➤ Place a piece of cardboard or a rug on a plane surface.

**3.** ➤ Place the housing with top cover facing down.

**4.** ➤ Separate housing feet from one another.



*Housing feet must be connected to all four corners. The connection surfaces must be free from dust. After cleaning these surfaces keep them free from dirt and do not touch them.*

**5.** ➤ Clean the surfaces on the corners of the housing using detergents and a soft cloth.

**6.** ➤ Remove protective foil from a single housing foot.

**7.** ➤ Carefully place the exposed housing foot in one corner of the housing.

**8.** ➤

### ! NOTICE!

Place housing foot carefully. Due to strong glue, it cannot be removed easily after glueing.

Press housing foot onto the surface.

- ⇒ The housing foot is firmly fastened to the housing.

**9.** ➤ Repeat steps 6 to 8 with all three remaining housing feet. If necessary, repeat cleaning procedure before fastening.

- ⇒ housing feet are firmly fastened at all corners of the housing.

## 7.6 Gas Conditioning

### Importance of Sample Gas Pressure

#### ! NOTICE!

#### Avoid overpressure above stated limits!

The Analyzer may be damaged if gas pressure exceeds the values specified in (🔗 *Chapter 3.1.4 "Gas Supply Data" on page 46*) in this manual.

- Always make sure to operate within the stated limits.

### Importance of Gas Conditioning

If the Analyzer is supplied with unconditioned gases, it may be damaged. If sample gas contains aggressive components, the gas paths' material may be affected. Ammonia and substances building up crystalline formation must be avoided. For accurate measurement results sample gases must also be dry and free from dust (free from particulates > 2 µm).

For proper gas conditioning ensure the following:

- Use a particle filter to remove particulates > 2 µm from gas streams.
- Use a cooler to ensure, the dew points are not reached.
- Ensure the pressures stated in (🔗 *Chapter 2.2.3 "Inputs and Outputs: Gas Connectors" on page 35*) are reached at the analyzer's connectors:
  - If gas supply does not provide sufficient pressure, install a pressure regulator.
  - If a flow meter is placed in the gas stream, ensure that pressure at the gas connectors of the analyzer is not reduced below minimal pressures.

### Enclosure purge option

#### ! NOTICE!

Purge the analyzer enclosure, if gases are supplied, which may harm analyzer components, when leaking into the enclosure!

The purge medium:

- must be dry, clean and free of corrosives or components containing solvents
- has to be free of components to be measured, to minimize cross interferences
- must correspond to the ambient temperature of the analyzer, but be at least within the range 20...35 °C (68...95 °F).



Set purge gas flow for purging enclosure to  $\geq 0.2$  NL/min at maximum inlet pressure of 0.1 barg (1.45 psig)

### How to supply sample gas

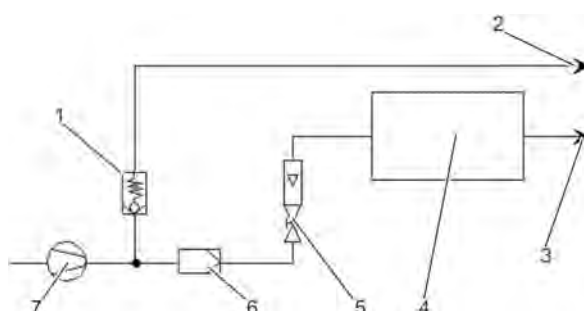


Fig. 68: Supplying sample gas

- 1 Pressure control valve
- 2 Exhaust
- 3 Exhaust
- 4 Analyzer
- 5 Flow sensor
- 6 Filter
- 7 Sample gas pump

The analyzer should be mounted close to the sample gas source to minimize transit time. A sample gas pump can be used to reduce the reaction time. This requires that the analyzer must be operated in bypass mode or fitted with a pressure control valve to protect against excessive gas flow and pressure.

## 7.7 Connecting gas lines

### Personnel:

- Laboratory researchers
- System integrator

### Protective equipment:

- Safety gloves



*Before operating the device, a leakage test has to be performed. Since gas connections used for leakage test differ from the actual measurement setup you should perform a leakage tests before connecting the gas lines intended for measuring.*

*For an overview of the gas connectors:  
 ↗ Chapter 2.2.3 "Inputs and Outputs: Gas Connectors" on page 35*

1. ➤ Perform leakage test ↗ Chapter 9.9 "Performing a Leakage Test" on page 187.
2. ➤ Ensure all gas supplies are turned off.
3. ➤ Ensure no exhaust reflow may take place through the exhaust line.
4. ➤ Ensure all gas line connectors match the connectors of the Analyzer.
5. ➤



### WARNING!

**Gas connection must be free of back pressure!**

Connect the exhaust line to the EXHAUST-Connector.

6. ➤ Connect sample gas supply to SAMPLE-IN-Connector.
7. ➤ Connect dry air supply to the AIR-IN-Connector.  
 ⇒ All lines are connected.
8. ➤ Establish gas supply to the SAMPLE-IN and AIR-IN-Connector.
9. ➤ Test tightness of SAMPLE-IN-Connector using leak detection spray as dictated by manufacturer.
10. ➤ Test AIR-IN using leakage test spray.
11. ➤ Test EXHAUST-IN using leakage test spray.
12. ➤ If the device is equipped with a purge gas connector:  
 Connect purge gas supply to PURGE-Connector.
13. ➤ If the device is equipped with a purge gas connector: Test PURGE-Connector using leakage test spray.  
 ⇒ If no leaks are detected, electrical connection can be established.

## 7.8 Establishing Electrical Connection

### Equipotential Bonding

Before establishing power to the device, make sure the following prerequisites are fulfilled:

- Power grid must provide a protective earth.
- Only suitable power cables provided by the manufacturer are to be used.



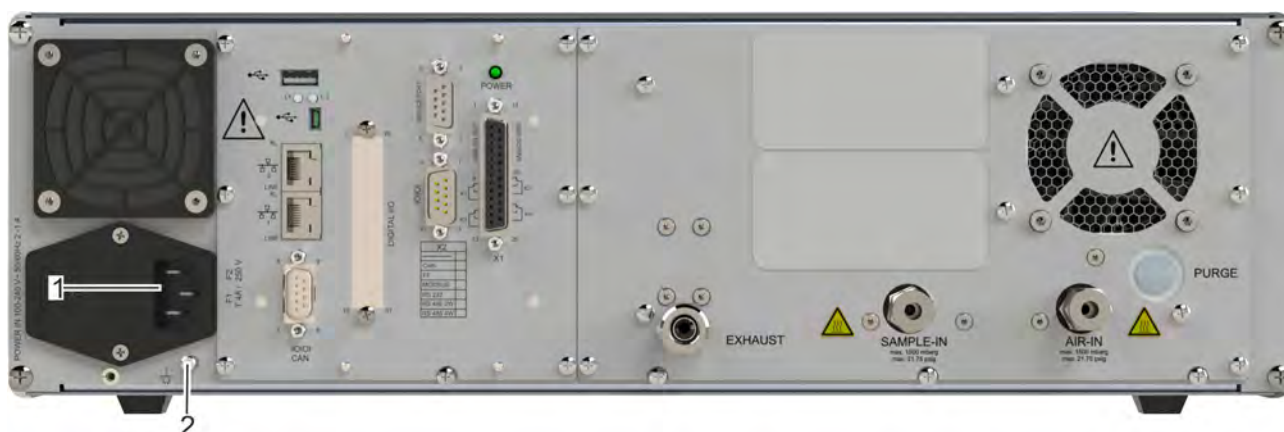


Fig. 69: Power Supply and Equipotential Bonding

- 1 Power cable connector
- 2 Equipotential bonding connector

1. Connect the on-site potential equalization to the equipotential bonding connector (Fig. 69/2).
2. Make sure ON/OFF-Switch is switched to position "0".
3. Plug power cable into power cable connector on the left side of the rear panel (Fig. 69/1).
4. Make sure on-site power grid meets the requirements stated in the technical data section.
5. Plug power plug into the socket.
  - ⇒ Device is supplied with mains voltage.

## 7.9 Notes on Wiring

### 7.9.1 Connecting Shields

#### Notes On Wiring Signal Inputs and Outputs

Emerson Process Management has made every effort during the development process, to ensure that the X-STREAM analyzer series complies with electromagnetic compatibility (EMC) with respect to emission and interference resistance, as confirmed by EMC measurements.

EMC, however, is not wholly influenced by the design of the instrument, but to a large degree by the on-site installation process. Please observe the following sections and precautions to guarantee the safe and problem-free operation of this analyzer.

We recommend the operation of our analyzers in TN-S or TT power supply systems which are favorable regarding EMC effects.

In order to minimise ambient electromagnetic interference, it is recommended to connect cable shields at all electrical connections between the analyzer and any other devices.

#### Shielding connected at both ends

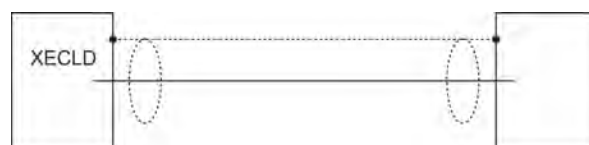


Fig. 70: Shielded signal cable (connected at both ends)

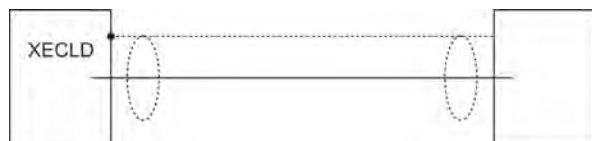
We recommend using only shielded signal cables. For TN-S and TT systems the shielding must be connected at both ends of the housing.

On-site conditions often differ from test environments and may require special precautions. Such a case arises when strong electromagnetic fields are present which could induce an interference current in the shielding. This type of current creates a potential difference between the connected housings.

Two possible methods of eliminating this e.g. in TN-C or TN-C-S systems are described here. Fitters familiar with EMC problems must decide which method should be employed.



## Shielding connected at one end

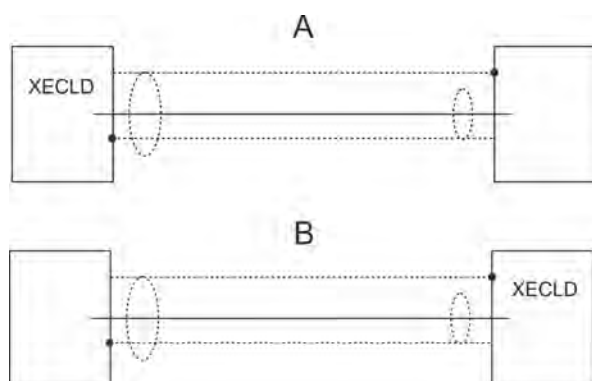


*Fig. 71: Shielded signal cable (connected at one end)*

The shielding is connected only at one end (connecting to the analyzer is recommended); this gives better protection against external interference, and interference currents are prevented because the ground loop is interrupted.

This is the preferred method for connecting cable shields in hazardous area installations, to prevent interference currents between connected enclosures.

## Double shielding



*Fig. 72: Shielded signal cable (double shielding)*

Cables with double shielding: in this case, one shielding is connected to the analyzer housing, the other shielding to the external device. This is advantageous when both units are supplied from different grids (e.g. when installed in different buildings). Another precaution for connections between buildings is using fiber optic cables.

This method is more expensive, but gives the best protection against external interference and against interference currents.

## Shield connector for screw terminal adaptors



*Fig. 73: Shield connector terminal with cable*

In order to avoid measured values being influenced by external interference signals when terminal adapters are in use, the signal cable shieldings must be connected to the analyzer housing using the shield connector.

## Connecting shield to screw terminal adaptors



The shield connector is available in different sizes → “Shield Connector Terminals” on page 227. Make sure to order a shield connector that fits the cable diameter. It is possible to retrofit the shield connector.

## Personnel:

- System integrator
- On-site service technician

1. ➤

### ! NOTICE!

Take care not to damage the braided shield!

Strip the signal cable to a length of 20 cm (8").

2. ➤ Pull up the contact part of the shield connector terminal and hold it up.
3. ➤ Lead stripped cable end through shield connector terminal as illustrated (Fig. 73).
4. ➤ Release the contact section down onto the braided shield.
  - ⇒ The installed spring pushes the contact section onto the cable shield. A secure electrical contact between contact and cable shield is established. Individual wires may be connected to terminal extensions.

## 7.9.2 Wiring different types of loads

### Wiring Inductive Loads

Switching inductive loads creates electromagnetic interference.

When an inductive load (e.g. relay, valve) is switched off, the magnetic field resists the change in current; this induces a high voltage across the coil contacts (several hundred volts). This impulse propagates through the connected cables and can influence any electrical devices nearby or destroy signal inputs and outputs. This can be avoided with a simple precaution:

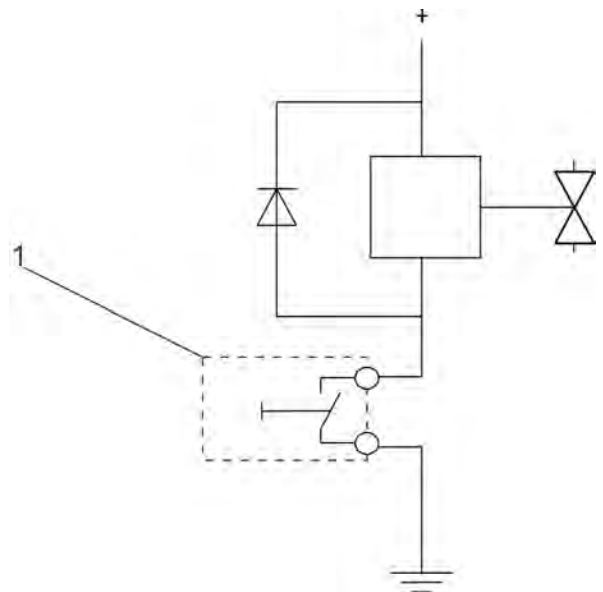


Fig. 74: Suppressor diode for inductive loads

1 Analyzer output

A silicon diode is connected in parallel to the load's contacts. The induced impulse is thus short-circuited at its source. The cathode must be connected to the positive end of the coil, the anode to the negative end.

### Driving High-Current Loads

Loads which draw a current in excess of the specifications for X-STREAM series analyzer outputs (>30 mA / >1 A) may not be directly driven from digital or relay outputs.

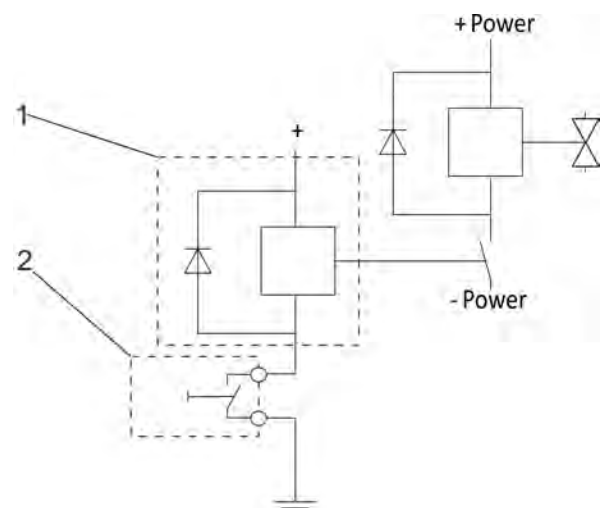


Fig. 75: Driving high-current loads

- 1 External relay (with suppressor diode)
- 2 Analyzer output

Such loads require external relays serving as decoupling modules: the X-STREAM output drives the external relay, which in turn drives the load.

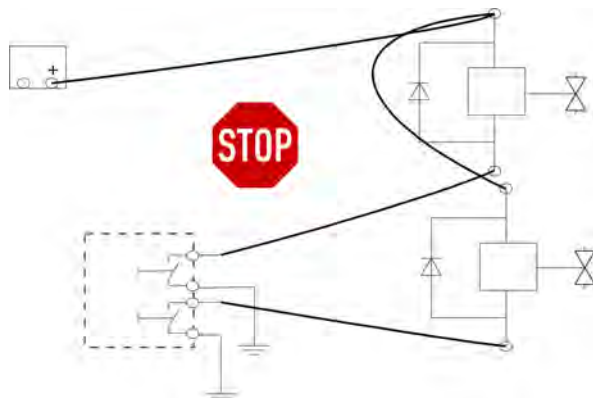
In order to avoid interference, we recommend supplying the analyzer and the high-current loads from different sources.

As previously described, the use of suppressor diodes for inductive loads is highly recommended.

## Driving Multiple Loads

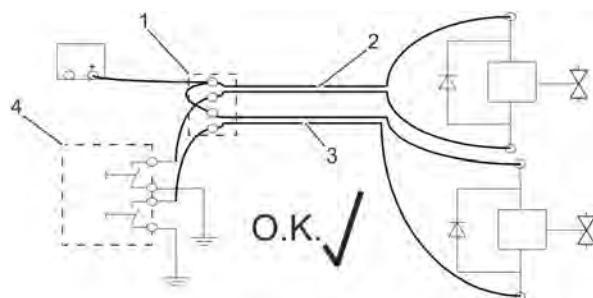
Frequently, several loads in one system are controlled by several analyzer outputs, whereby the power for the loads derive from a common source.

Special care is needed when wiring the loads to minimize interference from switching these loads.



**Fig. 76: Avoid: Common line**

Avoid connecting the loads to their power supply by a common line Fig. 76.



**Fig. 77: Preference: Loads in parallel**

- 1 Distribution point
- 2, 3 Cables to load outputs
- 4 Analyzer outputs

It is recommended to wire the loads separately, and to connect each load separately to the power supply. Beginning at the distribution point (Fig. 77/1), both the "+" and the "-" wires for each load (Fig. 77/2 and 3) are laid together to the load. Interference is further reduced if a twisted multi-core cable is used.



*Lay cables to the loads together as much as possible. Use twisted-pair cables if possible.*

## 8 Continuous operation

### 8.1 How to measure NO

#### Automatic measurement of NO

In continuous operation no manual action is necessary to measure NO. After starting up the Analyzer (☞ *Chapter 5 "Startup" on page 55*) and performed an initial calibration (☞ *Chapter 10 "Calibration and Validation Procedures" on page 196*), the values displayed at the measurement screen should be checked periodically.

If measured values are far from the expected values you might have to recalibrate.

During continuous operation you should also check for error messages regularly.

### 8.2 How to measure NO<sub>x</sub>

#### Automatic measurement of NO<sub>x</sub>

You need to switch from NO-Mode to NO<sub>x</sub>. If using an internal converter, an internal valve will switch and the sample gas will pass through the converter.

If using an external converter and therefore, the XECLD has no internal converter installed, you can use a digital output to switch an external valve when switching between NO- and NO<sub>x</sub> mode. (see SW digital outputs).

The rules of thumb valid for automatic measurement of NO (☞ *Chapter 8.1 "How to measure NO" on page 171*) can also be applied to automatic measurement of NO<sub>x</sub>.

Additionally you must make sure, the converter works as expected (☞ *"On the Converter" on page 171*) and the converter temperature is properly set ☞ *"Adjusting Converter Temperature" on page 172*.

#### On the Converter

The vitreous carbon converter used in this analyzer module must be checked periodically to assure that it is working at peak efficiency. The efficiency of the converter is typically 95 % to 98 %, that is, 95 % to 98 % of the nitrogen dioxide introduced to the module is reduced to nitric oxide.

Two conditions reduce the efficiency of the converter:

- The converter is operating at a temperature too low and the efficiency drops.
- The converter is operating at a temperature too high and the nitrogen dioxide is reduced to nitrogen, which is not detectable by the chemiluminescence reaction.

Initially, an interval of one week between converter efficiency checks is recommended because high temperature operation changes conditions inside the converter. The active surface area of the vitreous carbon increases through use. Initially, when the surface area is low, the temperature at which converter efficiency peaks is relatively high. This peak temperature moves downscale as surface area increases, and less external energy is required for adequate conversion.

The nominal range of converter operational temperature is 300 °C – 380 °C (572 °F – 716 °F). The current converter temperature can be viewed in the "CLD System" menu.

## Adjusting Converter Temperature

### Personnel:

- Laboratory researchers
- System integrator

### Materials:

- Converter test gas supply

1. ➤ Ensure the analyzer is powered up and no error messages considering temperature are being displayed.
2. ➤ Navigate to "System ➔ Control ➔ NO/NO<sub>x</sub> Mode"
3. ➤ Activate NO<sub>x</sub>-mode by selecting the corresponding menu entry "NO<sub>x</sub>".  
⇒ NO<sub>x</sub>-measuring mode is activated.
4. ➤ Make sure analyzer is fully calibrated with NO as span gas ➔ Chapter 10 "Calibration and Validation Procedures" on page 196.
5. ➤ If analyzer is fully calibrated, perform a validation.  
⇒ Validation does not show noticeable deviations.
6. ➤ Navigate to "System ➔ Setup ➔ CLD-System ➔ Converter Temperature".
7. ➤ Check displayed converter temperature.
8. ➤



*Technical gases typically have tolerances of the concentration which are specified in the data sheet (e.g. the gas has a concentration of 100ppm NO<sub>2</sub> +/- 5%). These tolerances need to be considered when evaluating converter efficiency e.g. by allowing concentrations above 90% instead of 95%. It is recommended to use a converter efficiency tester according to local regulations to get high accuracies.*

Apply a gas supply of NO<sub>2</sub> according to technical specifications ➔ Chapter 2.2.3 "Inputs and Outputs: Gas Connectors" on page 35.

9. ➤ Press Home-Button.
10. ➤ Check NO<sub>x</sub> concentration shown on Channel 1.

11. ➤ If concentration shown is above 95 % of known concentration of converter test gas does not need to be adjusted.
12. ➤ If concentration is below 95 %, navigate to "System ➔ Setup ➔ CLD-System ➔ Converter Temperature Setpoint"
13. ➤ Adjust temperature set point to 300 °C.
14. ➤ Press Home-Button.
15. ➤ Check concentration shown.  
⇒ If a concentration above 95% is displayed, the converter has been successfully adjusted. Procedure may be aborted.
16. ➤ If a concentration below 95% is displayed, navigate to "System ➔ Setup ➔ CLD-System ➔ Converter Temperature Setpoint".
17. ➤ Increase temperature set point by +20°C (+36 °F)
18. ➤ Press Home-Button.
19. ➤ Check NO<sub>x</sub> concentration shown on Channel 1.
20. ➤ If a concentration below 95% is displayed, repeat steps 16 – 20.
21. ➤ If a concentration above 95% is displayed, proceed with step 22.
22. ➤ Navigate to "System ➔ Setup ➔ CLD-System ➔ Converter Temperature Setpoint".
23. ➤ Decrease temperature set point by -5 °C (-9 °F)  
⇒ Converter has been successfully adjusted.
24. ➤ If no setting allows reaching measured concentrations above 95% check service interval.
25. ➤ If a service is due or nearly due, exchange converter ➔ Chapter 9.5 "Exchanging Converter" on page 178 .
26. ➤ If service interval for converter is still far from actual date the analyzer may be defective. Please contact customer service ➔ Chapter 12.1 "Customer Service" on page 214.

### Converter Efficiency Test

If the converter efficiency needs to be measured with high accuracy independent of tolerances of technical gases, a converter efficiency tester which meets to local regulations is required. These testers make use of external ozone generators. After measuring the concentration of a NO test gas with the CLD in NO mode, parts of this gas are converted to NO<sub>2</sub> prior the the CLD by applying ozone. This reduces the NO reading of the CLD by the amount of generated NO<sub>2</sub>. Afterwards the generated gas is passed through the converter by switching the CLD to NO<sub>x</sub> mode. If the converter has an efficiency of 100%, all the generated NO<sub>2</sub> is converted back to NO in the converter and the reading is identical to the initially measured NO concentration. From the deviation, the converter efficiency can be calculated.



*For the United States, a converter efficiency tester is defined in the Code of Federal Regulations §90.318 and §90.319.*



## 9 Maintenance and Other Procedures

### 9.1 Safety on Maintenance

#### Electrical shock



#### **WARNING!**

**Danger of electrical shock or burns from performing product maintenance without necessary knowledge!**

If Maintenance tasks, especially within the housing, are performed without the necessary product knowledge, dangerous situations may arise.

- Always read instructions in this manual before performing any maintenance tasks.
- Only perform product maintenance as described in this manual.
- If maintenance tasks not described in this manual are to be performed, contact manufacturer.

### 9.2 Maintenance Overview

#### On the Intervals Stated

The intervals stated in the following overview represent values based on product knowledge and experience in the field of gas analysis. These intervals do not take the specific conditions on site into account.

In dirty environments for instance you might have to exchange filters more often than stated in this manual. If you need support on choosing the fitting intervals for your site of operation please contact our service ↗ *Chapter 12 "Service Information" on page 214.*

## Maintenance Table

Interval	Maintenance work	Personnel
Every 8 hours or less*	Perform calibration ↗ Chapter 10 "Calibration and Validation Procedures" on page 196	Analyzer operator
3-monthly	Exchange housing filter ↗ Chapter 9.8 "Exchanging Housing Filter" on page 186	On-site service technician
6-monthly	Perform leakage test ↗ Chapter 9.9 "Performing a Leakage Test" on page 187	On-site service technician
Annually	Exchange converter glass tube ↗ Chapter 9.5 "Exchanging Converter" on page 178	On-site service technician
If needed	Perform leakage test ↗ Chapter 9.9 "Performing a Leakage Test" on page 187	Analyzer operator

\*If you need very high measurement accuracy we recommend a calibration interval of 8 hours.

## 9.3 Preparing Maintenance

### 9.3.1 Purging Gas Lines



Make sure no reflow of gas into the operation site is possible. When using site supply of  $N_2$  make sure both gas lines are purged synchronously.

The following procedure describes manual purging. Refer to software description or contact customer service for information on automatic purging.



#### WARNING!

**Harmful exhaust gas or ozone may leak if gas lines are not purged as described!**

For all work inside the apparatus and whenever gas lines are to be opened, the gas lines have to be purged beforehand.

1. ➤ Connect inert gas supply to sample inlet.
2. ➤ Make sure no reflow will come through ozonator air supply by using a blind union or keeping regular air supply attached.

3. ➤



#### NOTICE!

Do not exceed pressure printed on the Analyzer's connectors.

Open inert gas supply and let the inert gas drive out the sample gas for approx. 10 min.

4. ➤ Connect inert gas supply to ozonator air supply. Make sure no reflow will come through sample supply by using a blind union or keeping inert gas supply attached.
5. ➤ Open inert gas supply and let the inert gas drive out the ozonator air for approx. 10 min.

- ⇒ Sample gas and ozone have been purged.

### 6. ➤ Disconnect inert gas supply.

- ⇒ Measuring unit may be accessed.

### 9.3.2 Making Measuring Unit Accessible



#### **WARNING!**

#### **Danger due to potential gas explosion!**

When gas lines are opened, ozone and/or nitrogen oxides may leak out.

- Make sure ventilation is sufficient.
- Do not breathe in the vicinity of recently opened gas lines.
- Make sure gas lines are purged as described in this manual & Chapter 9.3.1 “Purging Gas Lines” on page 175.

#### **Personnel:**

- On-site service technician

#### **Protective equipment:**

- Safety gloves
- Safety shoes

1. ➤ Make sure analyzer is properly purged & Chapter 9.3.1 “Purging Gas Lines” on page 175.
2. ➤ Make sure all gas connections are free of pressure.
3. ➤ Make sure the top and the rear of the Analyzer are accessible.
4. ➤ Switch off power at the On/Off Switch.
5. ➤ Unplug power line from socket.
6. ➤ Unplug IEC connector.
7. ➤ Let Analyzer cool down for approx. 1 h.
8. ➤ If gas supplies or exhaust lines have to be disconnected, seal the connectors.

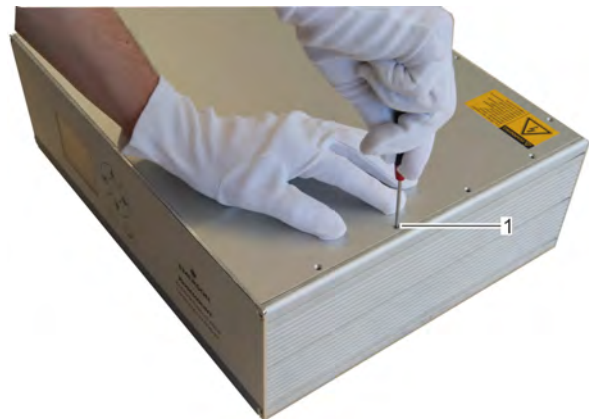


Fig. 78: Remove top cover screws

### 9. ➤



There are four screws on each side and four screws at the rear of the top cover.

Unscrew and remove all fastening screws from the top cover (Fig. 78).

10. ➤ Lift top cover on the rear of the Analyzer.
11. ➤ Remove and safely store top cover.

12. ➤



## WARNING!

**Do not touch module cover before measuring temperature!**

Measure temperature at the surface of the module cover.

13. ➤

If measured temperature exceeds 65 °C (150 °F) make sure the Analyzer cools down until the measured temperature is below 65 °C (150 °F).

⇒ When wearing safety gloves, no burns can occur.

14. ➤

Unscrew and remove two fastening screws of the module cover.

15. ➤

Lift rear of module cover.

16. ➤

Remove and safely store module cover.

⇒ Top cover and module cover have been removed and safely stored. The measuring module is accessible.

## 9.4 Cleaning the analyzer

### Personnel:

- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

### Materials:

- Detergents

The decision on how frequently the analyzer should be cleaned strongly depends on environmental conditions. You should always keep the surfaces and all rear connectors free of dust. Additionally the air inlet and outlet must not be blocked by dust or any other substances or objects.



## WARNING!

**Harmful exhaust gas or ozone may leak and electric shock may occur if purging is skipped or liquids are spilled!**

1. ➤

Purge gas lines ➤ *Chapter 9.3.1 "Purging Gas Lines" on page 175.*

2. ➤



## NOTICE!

Add clear water or non-aggressive detergent. Do not scrub! Do not spill!

Carefully clean the display using a fresh lint-free cloth.

3. ➤

Carefully clean all surfaces using a lint-free cloth.

4. ➤

Dust off all connectors at the rear panel.

5. ➤

Check housing filter for obstructions.

6. ➤

If dust, objects or other substances visibly block the air inlet, remove them. If not removable exchange housing filter ➤ *Chapter 9.8 "Exchanging Housing Filter" on page 186.*

⇒ The housing filter is cleaned or replaced. All surfaces are clean and dust-free. The Display is well legible and free of stains.

## 9.5 Exchanging Converter

### Converter Failures

The usual case of converter failure is caused by the destruction of a large part of the catalytic material by excessive heat. This is due either to an excessively high temperature setpoint or failure of the converter temperature control circuitry.

#### Personnel:

- On-site service technician

#### Protective equipment:

- Safety gloves
- Safety shoes

#### Special tool:

- External hexagon nut with extension (5.5 mm)

If a conversion efficiency below nominal conversion rate is not due to measurement error introduced by the test setup, the converter must be replaced.



#### WARNING!

**Danger of serious burns on hot converter! Always check temperature and let converter cool down before touching.**

1. ➤ Make measuring unit accessible & Chapter 9.3.2 "Making Measuring Unit Accessible" on page 176.

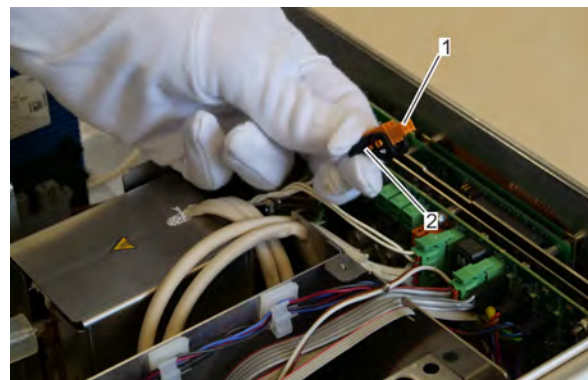


Fig. 79: Orange plug

- 1 Orange plug (unplugged)
  - 2 Rocker lever (on both sides)
2. ➤ Loosen orange connector by tilting rocker lever.
  3. ➤ Unplug orange connector.



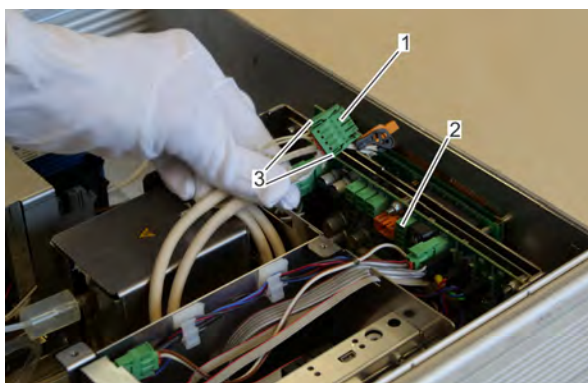


Fig. 80: Green plug

- 1 Green plug (unplugged)
  - 2 Socket
  - 3 Locks
4. ➤ Press locks of green connector while unplugging from socket.
- ⇒ Orange and green connectors are unplugged.

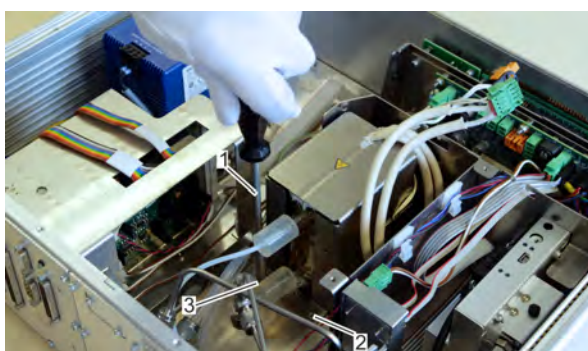


Fig. 81: Unscrewing self-locking nuts

- 1 Extension with hexagonal socket nut
- 2, 3 Self-locking nut

5. ➤



*Do not fully unscrew nuts. Unscrew the nuts at all four corners of the converter cover baseplate (only two are shown in Fig. 81).*

Unscrew four self-locking nuts with 2 to 3 turns.

⇒ The baseplates of the converter cover are no longer clamped.

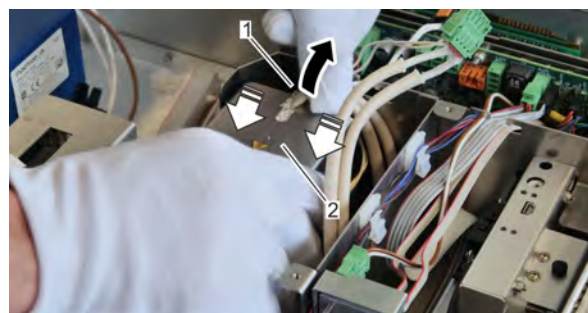


Fig. 82: Remove cover

6. ➤ Carefully move connection cable out of slot in converter cover.
7. ➤ Move converter cover towards front plate until it is free of the fastening nuts.
8. ➤ Lift up and remove converter cover.
9. ➤ Arrange the cables in a manner such that the converter cover can be placed next to the side panel.

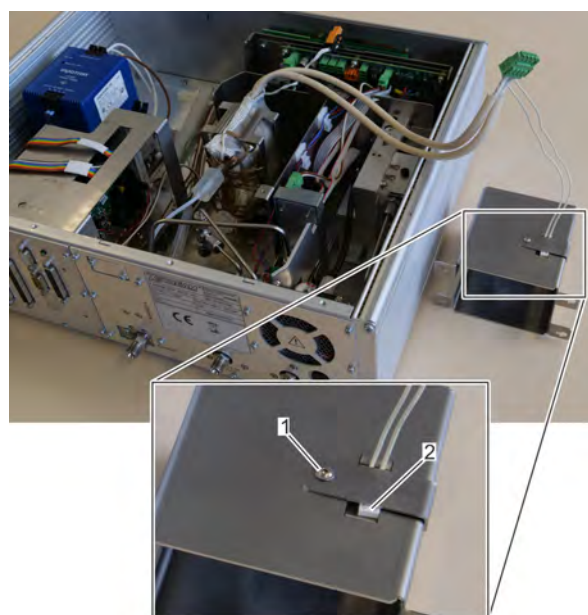


Fig. 83: Removed converter cover

- 1 Hex screw
- 2 Overtemperature switch

10. ➤ Place converter cover next to housing.

11. ➤



*2,5 mm (0.1 in) hex key is required. Make sure to remember the orientation of the sensor.*



Optional: Remove overtemperature switch from converter housing.

⇒ If required the overtemperature switch may be removed or replaced.

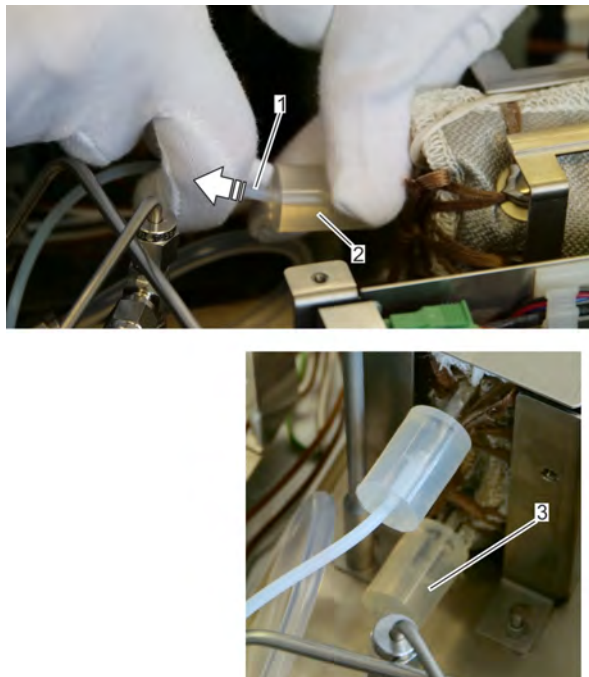


Fig. 84: Unplug inlet gas line

- 1 Gas line inlet
- 2 Elastomer seal
- 3 Elastomer seal (exhaust fume line)

**12.** ▶ Unplug inlet gas line from elastomer seal.

**13.** ▶ Unplug exhaust fume line from elastomer seal.

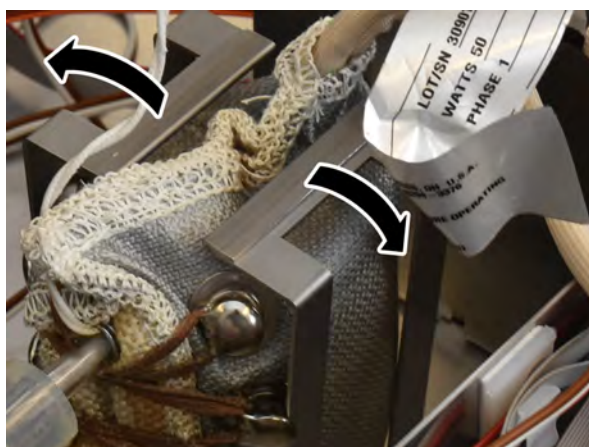


Fig. 85: Bend brackets

**14.** ▶

## ! NOTICE!

**Bend bracket only as far as is necessary to remove heater jacket.**

Bend open both metal brackets approx. 15 °. Do not overbend.

⇒ Heater jacket is removable and no longer clamped by the metal brackets.

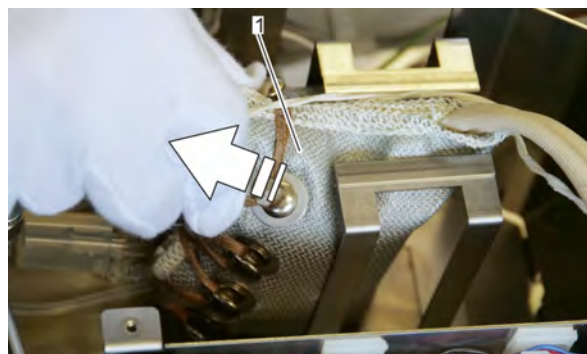


Fig. 86: Remove heater jacket

1 Heater jacket

**15.** ▶

## ! WARNING!

**Check temperature before touching heater jacket. If too hot, let it cool down!**

Carefully pull out heater jacket in the direction of the rear panel.

**16.** ▶ Remove the heater jacket and carefully move the connected cables out of the case.

**17.** ▶ Place heater jacket on a clean and firm surface.

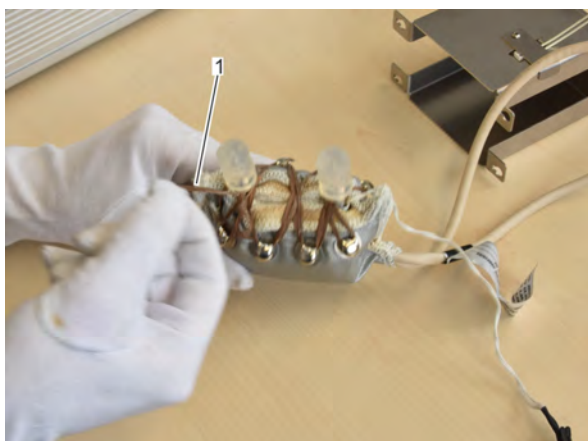


Fig. 87: Unlace heater jacket

1 Lace

18. Carefully unlace heater jacket.

19.



### WARNING!

Check temperature before touching glass tube. If too, hot let it cool down!

Open heater jacket.

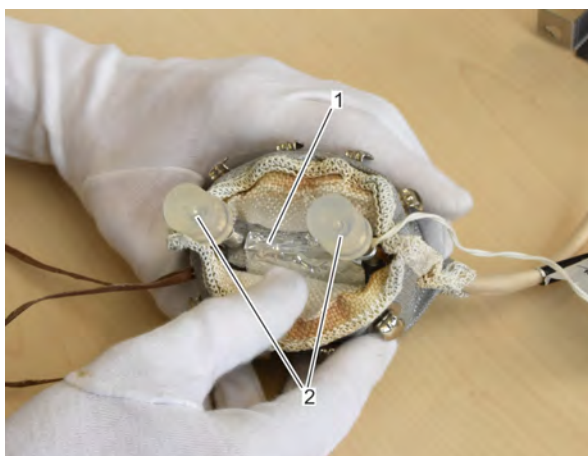


Fig. 88: Opened heater jacket

1 Converter tube

2 Elastomer seals

⇒ Converter tube is accessible.

20.

### ! NOTICE!

Avoid pressure to the glass tubes.

Carefully remove converter from heater jacket. Avoid especially bending strain to the glass tubes holding the elastomer seals.

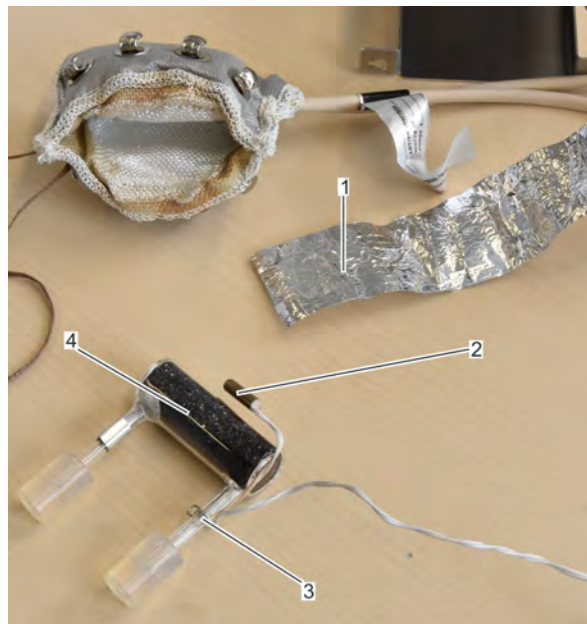


Fig. 89: Unwrapped converter

1 Aluminium foil

2 Temperature sensor

3 Fixing clip

4 Converter

21. Carefully unwrap aluminium foil from glass tube. Make sure foil is not damaged or fully unfolded so it can be reused.

⇒ Aluminium foil is completely unwrapped and removed. The temperature sensor becomes visible and accessible.

22. Remove both elastomer seals from glass tubes.

23. Squeeze fixing clip while removing it from the glass tube.

⇒ Temperature sensor is detached from converter tube.

24. Dispose of old converter tube according to local regulations. If required, reference the safety data sheet provided by the manufacturer.

⇒ Old converter tube is disposed of. The replacement converter tube may now be installed.

25. Attach the connection cable of the temperature sensor to the input glass tube of the converter tube.

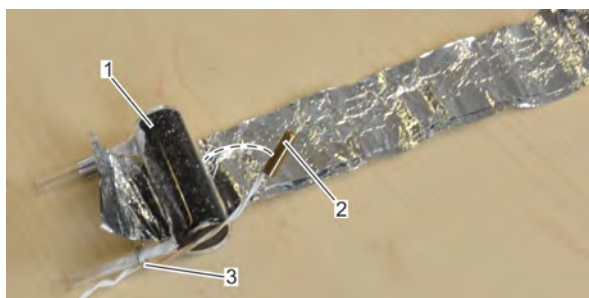


Fig. 90: Fix sensor connection cable

- 1 Converter
- 2 Temperature sensor
- 3 Fixing clip

**26.** Adjust clamped cable length so, so the temperature sensor can be placed in the middle of the converter tube on the opposite side of the glass tubes.

**27.** Wrap one tier of aluminium foil around converter tube.

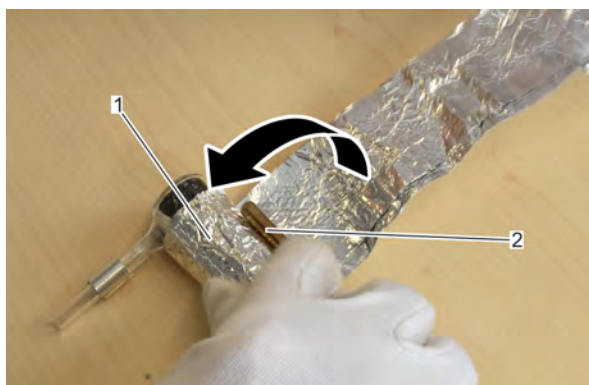


Fig. 91: Wrap in sensor

- 1 Tier of aluminium foil
- 2 Temperature sensor

**28.** Place temperature sensor in the middle of the converter tube on the opposite side of the glass tubes and carefully wrap another tier of aluminium foil around it to fix it in place.

**29.** Wrap the remaining aluminium foil around converter tube. Assure the sensor remains on the opposite side of the glass tubes and is firmly pressed onto the converter tube.

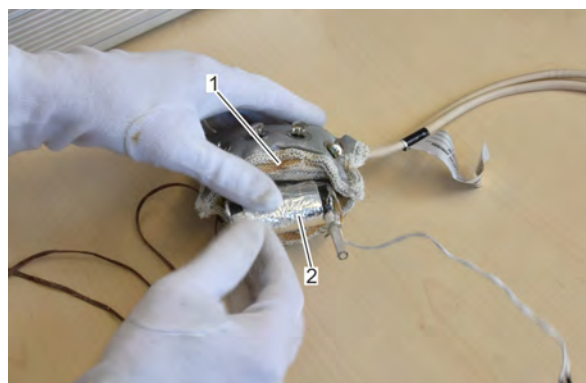


Fig. 92: Insert wrapped converter

- 1 Heater jacket
- 2 Wrapped converter

**30.**

**! NOTICE!**

**Avoid pressure to the glass tubes.**

Place converter tube into heater jacket. Push it in all the way.

**31.** Re-tie the lace of the heater jacket so that all knobs are in use.

⇒ Heater jacket closes firmly around converter tube. Converter tube and glass tubes are undamaged.

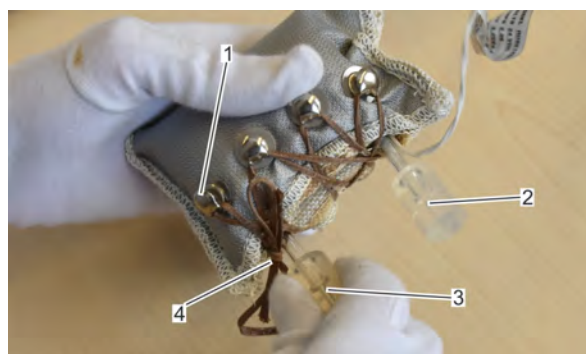


Fig. 93: Plug seals

- 1 Knob
- 2, 3 Elastomer seal
- 4 Tied lace

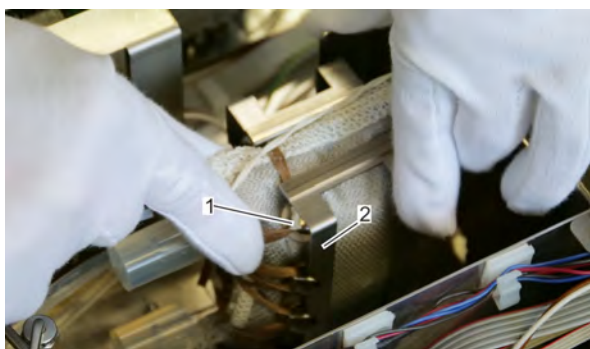
**32.**



*Use the bigger boring of the seals.*

Plug elastomer seals onto the glass tubes. Leave approx 1 mm (0.04 in) of space to the end of the boring.

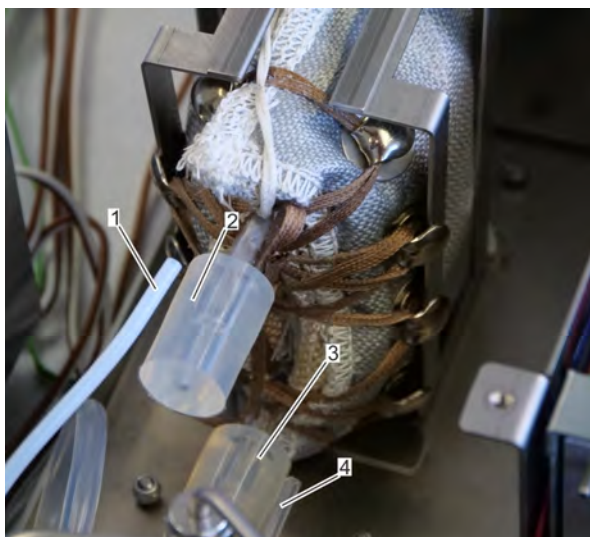




*Fig. 94: Inserted heater jacket*

- 1 Knob
- 2 Bracket

**33.** Bend metal brackets open and insert heater jacket. Knobs must be level with bracket.

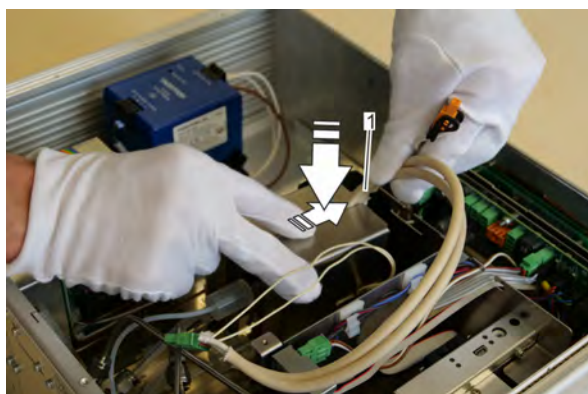


*Fig. 95: Reconnect gas lines*

- 1 Gas inlet line
- 2 Elastomer seal (gas inlet line)
- 3 Elastomer seal (exhaust line)
- 4 Exhaust line

**34.** Connect exhaust line to lower elastomer seal.

**35.** Connect gas inlet line to upper elastomer seal.



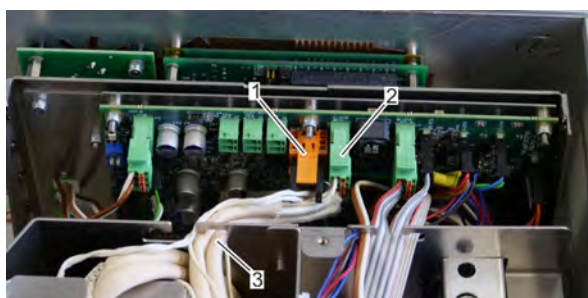
*Fig. 96: Place converter cover*

- 1 White cable

**36.** Place converter cover onto metal brackets while routing out white cable through cutout.

**37.** Slide converter case onto the fixing screws while pressing it down lightly.

**38.** Refasten fixing screws.



*Fig. 97: Plugged connectors*

- 1 Orange connector
- 2 Green connector
- 3 Placed cables

**39.** Plug green connector onto the free green socket on the circuit board.

**40.** Plug orange connector onto the free orange socket on the circuit board.

**41.** Place cables between converter case and air baffle.

**42.** Visually check position of elastomer seals.

**43.** Carefully place module cover. Make sure the side plates engage with the designated slots.

**44.** Fasten module cover with two screws.

**45.** Place top cover.

**46.** Fasten top cover with 12 screws.

- ⇒ Converter replacement is complete. Before operating the Analyzer, a gas leakage test must be performed [Chapter 9.9 “Performing a Leakage Test” on page 187](#).



After a leakage test has been performed, the Analyzer may be reconnected to gas lines and power supply. On first, startup after replacing the converter make sure the converter reaches the preset temperature. If does not, the temperature sensor may be defective or improperly placed or wrapped. Only operate Analyzer if preset temperature is reached.

## 9.6 Exchanging Power Connector Fuse

### Personnel:

- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

### Materials:

- Replacement fuse



Only replace fuses with those listed in the spare parts list [“Fuses” on page 227](#).

1. ➤ Switch off Analyzer at the ON/OFF switch.
2. ➤ Disconnect power line from grid.
3. ➤ Unplug IEC connector.  
⇒ Analyzer is completely disconnected from power.



Fig. 98: Fuse holder

- 1 Fuse holder
4. ➤ Carefully unlock fuse holder using a small screwdriver.
5. ➤ Lever out fuse holder.  
⇒ The fuse holder is accessible and can be pulled out by hand.
6. ➤ Pull out fuse holder.  
⇒ Two fuses become accessible.
7. ➤ Replace blown or broken fuses with new ones.

8. ➤



Only one orientation is possible.

Re-insert fuse holder and push it all the way towards the end-stop.

⇒ Fuse holder is fully inserted.

**9.** ➤ Reconnect IEC connector.

**10.** ➤ Reconnect power line to grid.

### 9.7 Exchanging Power Supply Fuses

#### Personnel:

- On-site service technician

#### Protective equipment:

- Safety gloves
- Safety shoes

#### Materials:

- Replacement fuse



*Two identical fuses are used within the fuse holders.*

*Only replace fuses with unused ones and as listed in the spare parts list ↗ “Fuses” on page 227.*

**1.** ➤ Switch off Analyzer at the ON/OFF switch.

**2.** ➤ Disconnect power line from grid.

**3.** ➤ Unplug IEC connector.

⇒ Analyzer is completely disconnected from power.

**4.** ➤ Wait for approx. 30 min.

**5.** ➤ Make measuring unit accessible ↗ Chapter 9.3.2 “Making Measuring Unit Accessible” on page 176.



*Fig. 99: Power supply fuse holders*

- 1 Fuse in holder
- 2 Fuse holder 1 (closed)
- 3 Fuse holder 2 (opened)

**6.** ➤ Remove blown fuse from opened holder.

**7.** ➤ Insert a suitable replacement fuse for internal power supply ↗ “Fuses” on page 227.



8. ➤ Close fuse holder and press down until a snap is heard.
9. ➤ Reconnect IEC connector.
10. ➤ Reconnect power line to grid.
  - ⇒ The fuse has been replaced and the analyzer may be powered on.

### 9.8 Exchanging Housing Filter

#### Personnel:

- On-site service technician

#### Protective equipment:

- Safety gloves
- Safety shoes

#### Materials:

- Replacement housing filter

The housing filter must, in general, be replaced as stated in the maintenance overview *Chapter 9.2 "Maintenance Overview" on page 174*. Depending on on-site air quality, the interval, must be shortened. If the air filter is visibly clogged it must be replaced.



Fig. 100: Filter

- 1 Filter cover
- 2 Housing filter

1. ➤ Switch off Analyzer at the ON/OFF switch.
2. ➤ Disconnect Analyzer from grid.
3. ➤ Carefully remove filter cover.
  - ⇒ Housing filter is accessible.
4. ➤ Remove old housing filter.
5. ➤ Insert new housing filter. Make sure the filter rests plainly in seat.
6. ➤ Place filter cover.
  - ⇒ Filter cover is fixed in position by four screws.
7. ➤ Dispose of old housing filter according to local regulations.
  - ⇒ Exchanging housing filter is complete.

## 9.9 Performing a Leakage Test

### Personnel:

- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

### Materials:

- Leakage test gas supply (N<sub>2</sub> or He)



2 blind unions (1/4" or 6 mm) are needed to perform a leakage test.

After gas lines have been opened or, at least twice a year, the reassembled Analyzer must be pressure-tested for leakages.

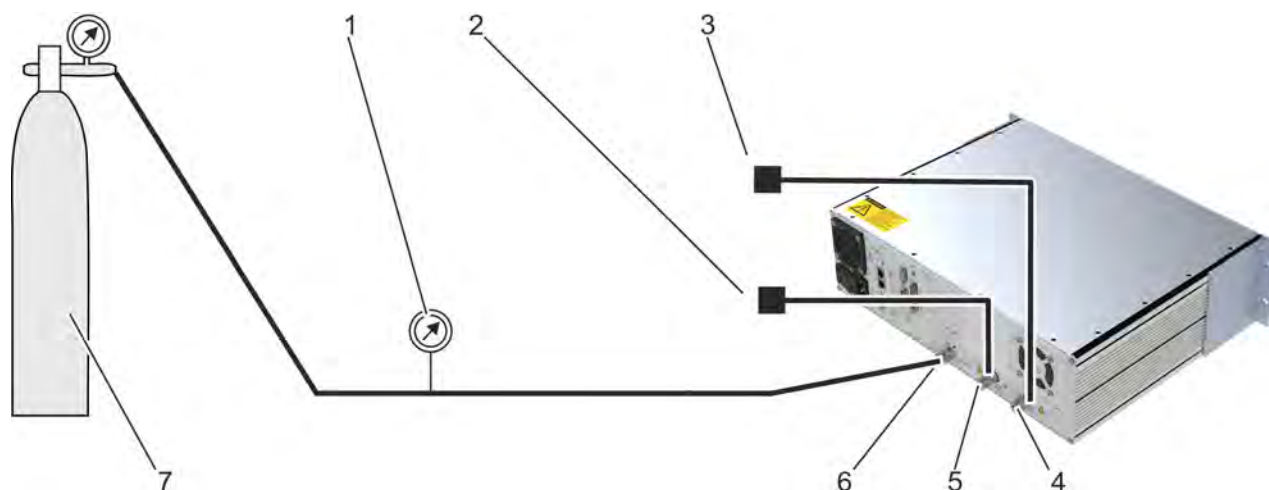


Fig. 101: Leakage test

- |                                           |                                     |
|-------------------------------------------|-------------------------------------|
| 1 External manometer: 15 psig = 1,000 hPa | 5 SAMPLE-IN-Connector               |
| 2 Sample gas line (closed)                | 6 EXHAUST-Connector                 |
| 3 Ozone generator air supply (closed)     | 7 Gas Source (N <sub>2</sub> or He) |
| 4 AIR-IN-Connector                        |                                     |

1. ➤ Close sample gas and ozone generator air supplies.
2. ➤ Purge gas lines ➤ *Chapter 9.3.1 "Purging Gas Lines" on page 175.*
3. ➤ Disconnect gas connections.
4. ➤ Shut off ozone generator air supply using a blind union.
5. ➤ Shut off sample gas inlet using a blind union.
6. ➤ Connect a manometer to the EXHAUST connector.
7. ➤ Connect an external gas supply to the manometer.
8. ➤ Set external gas pressure to 1034 hPa (15 psig).
9. ➤ Supply Analyzer with the external gas supply.

⇒ After approx. 10 seconds a stable pressure should be shown on the external manometer.

- 10.** ► Close external gas supply.
- 11.** ► Observe pressure drop on the external manometer for 15 minutes.
- 12.** ► If pressure drops for more than 7,5 hPa/min (He) or 2,5 hPa/min (N<sub>2</sub>), leakage test has failed. Seals must be checked. Do not operate the Analyzer if leakage test failed. Contact customer service if no measurement (e. g. tightening screws or replacing seals) results in passing leakage test ↪ *Chapter 12.1 "Customer Service" on page 214.*
- 13.** ► If pressure drops to less than 7,5 hPa/min (He) or 2,5 hPa/min (N<sub>2</sub>) the leakage test has passed and Analyzer may be operated.

### 9.10 Fine Adjusting Pressure Measurements

If either one of the pressure sensors of the analyzers needs replacement, a fine adjustment of the sensors is necessary to assure high measurement quality.

#### Personnel:

- On-site service technician
- Laboratory researchers

#### Preparing pressure sensor adjustments

- 1.** ► Make sure analyzer is properly purged  
↪ *Chapter 9.3.1 "Purging Gas Lines" on page 175.*
- 2.** ► Make sure all gas connections are free of pressure.
- 3.** ► Disconnect all gas connections.  
⇒ All gas connection are open.
- 4.** ► Power on the device and wait for up to 1 hour until temperatures have stabilized.  
⇒ The Analyzer is running and no temperature related warnings are being displayed.
- 5.** ► Navigate to "System → Setup → CLD-System → Page 3" and set both offset values to "0".

#### Adjusting Chamber Pressure

- 6.** ► Navigate to "System → Setup → CLD-System → Page 3" and verify that both offset values are set to "0".
- 7.** ► Read the measured Chamber pressure value from the menu and adjust the corresponding offset value to this value.  
⇒ The measured chamber pressure value is now 0.

#### Adjusting Sample Pressure

- 8.** ► Navigate to "System → Setup → CLD-System → Page 3" and verify that the chamber pressure offset has been adjusted and the offset for sample pressure has been set to "0".

If chamber pressure offset has not been adjusted or sample pressure offset has not been set to "0", repeat steps 6 and 7.

9. ➤ Read the measured sample pressure value from the menu and adjust the corresponding offset value to this value.

⇒ The measured sample pressure value is now "0". The device is now ready to be operated and can be reconnected to the gas supplies.

### 9.11 Saving and Restoring Configuration Data Sets

After some time of operating the instrument, one can assume all the parameters (calibration/validation gases setup, measuring ranges, inputs and outputs and so forth) are setup to meet the application's and operator's needs. To save these settings for means of restoring them in case of failures, data loss or even overwriting, use the options of the menu "System ➔ Setup ➔ Save-Load".



*By default, some of the functions mentioned in the following procedures are password protected.*

#### Saving a Local backup



*Use this option to save the current data in a special analyzer memory section.*

#### Personnel:

- Laboratory researchers
- System integrator

#### ! NOTICE!

New backups will overwrite previous backups. Overwritten internal backups cannot be restored.

1. ➤ Navigate to "System ➔ Setup ➔ Save-Load".
2. ➤ Select Menu entry "Local backup..".
3. ➤ Select Menu entry "Save..".
  - ⇒ A screen appears to confirm the operation.
4. ➤ Select the desired Menu entry:
  - "No!": Abort backup.
  - "Yes!": Starts local backup.
  - ⇒ If "Yes!" is selected, a local backup is performed. The counter at menu entry "Progress (0..1000)" shows "1000" when backup has finished.

#### Restoring a Local Backup



*Use this option to restore a local backup saved in the internal memory of the analyzer.*

### Personnel:

- Laboratory researchers
- System integrator

### ! NOTICE!

Restoring a local backup will overwrite current settings. Overwritten settings cannot be restored.

1. ➤ Navigate to "System ➔ Setup ➔ Save-Load".
2. ➤ Select Menu entry "Local backup..".
3. ➤ Select Menu entry "Restore..".
  - ⇒ A screen appears to confirm the operation.
4. ➤ Select the desired Menu entry:
  - "No!": Abort restoring process.
  - "Yes!": Start restoring process.
  - ⇒ If "Yes!" is selected, a local backup is restored. The counter at menu entry "Progress (0..1000)" shows "1000" when backup has finished.
5. ➤ If you wish to undo the restore process, select menu entry "Undo restore!".
  - ⇒ If not undone, the analyzer is set to the restored system settings. If undone, system settings remain unchanged

### Restoring Factory defaults



*This is the data stored in a special memory section after the instrument has been configured in the factory. The user cannot change, but only restore this data.*

### Personnel:

- Analyzer operator
- System integrator

### ! NOTICE!

Restoring factory defaults will overwrite current settings. Overwritten settings cannot be restored.

1. ➤ Navigate to "System ➔ Setup ➔ Save-Load".
2. ➤ Select Menu entry "Factory defaults..".
3. ➤ Select Menu entry "Restore..".
  - ⇒ A message to confirm the operation is displayed.
4. ➤ Select the desired Menu entry:
  - "No!": Abort restoring process.
  - "Yes!": Start restoring process.
  - ⇒ If "Yes!" is selected, a local backup is restored. The counter at menu entry "Progress (0..1000)" shows "1000" when backup has finished.
5. ➤ If you wish to undo the restore process, select menu entry "Undo restore!".
  - ⇒ If not undone, the analyzer is set to the restored system settings. If undone, system settings remain unchanged.

### Preparing USB Backup

### ! NOTICE!

Since not all devices work with the analyzer, check for full functionality before relying on a data backup.

Formatting cannot be undone using the analyzer.

Use only a USB Type A Interface to plug in USB data storages ➔ Chapter 2.2.2 "Inputs and Outputs: Data Connectors" on page 20.

## Personnel:

- Laboratory researchers
- System integrator

## Materials:

- USB storage device

## Enable USB-devices

1. ➤ Check menu entry "System ➔ Setup ➔ USB Interface". If the menu Entry "Interface" is "disabled", activate USB-devices by changing menu entry to "Enabled".
  - ⇒ USB devices will now be detected by the analyzer and can be used.

## Format device

2. ➤ Plug USB storage device into USB-A connector at the backpanel of the device
  - ✎ Chapter 2.2.2 "Inputs and Outputs: Data Connectors" on page 20.
  - ⇒ If the device is detected and accepted, "USB" is displayed at the top of the screen.

## 3. ➤

### ! NOTICE!

Formatting will delete all data on you USB storage device.

Select menu entry "Format USB Stick.." and confirm by selecting "Yes!"

- ⇒ USB stick is being formatted and a basic file system structure is created. After formatting, the device can be used to store a backup.

## Saving USB Backup



This option enables to save an analyzer configuration to an external USB device. This way e.g. administrators can save Analyzer configurations separately from the Analyzer and store them at a safe location

## Personnel:

- Laboratory researchers
- System integrator

## Materials:

- USB storage device

1. ➤ Navigate to "System ➔ Setup ➔ Save-Load".
2. ➤ Plug USB storage device containing a valid backup into USB-A-Connector at the back-panel of the device ✎ Chapter 2.2.2 "Inputs and Outputs: Data Connectors" on page 20.
  - ⇒ If the device is detected and accepted "USB" is displayed at the top of the screen.
3. ➤ Select menu entry "USB backup..".
4. ➤ Select menu entry "Save..".
  - ⇒ A message to confirm the saving operation is displayed.
5. ➤ Confirm or abort backup process by selecting the desired menu entry:
  - "No!": Abort backup process.
  - "Yes!": Start backup process.
  - ⇒ If "Yes!" is selected, a local backup is restored. The counter at menu entry "Progress (0..1000)" shows "1000" when backup has finished.

## Restoring USB Backup



This option enables to restore an analyzer configuration from an external USB device.



## Personnel:

- Laboratory researchers
- System integrator

## Materials:

- USB storage device

Once a backup from a USB device has been restored, the process can be undone via corresponding menu entry.

1. ➤ Plug USB storage device into USB-A connector at the backpanel of the analyzer  
↳ “Preparing USB Backup” on page 190.
2. ➤ Navigate to “System ➔ Setup ➔ Save-Load”.
3. ➤ Select menu entry “USB backup..”.
4. ➤ Select menu entry “Restore..”.  
⇒ A message to confirm the operation is displayed.
5. ➤ Confirm or abort backup process by selecting the desired menu entry:
  - “No!”: Abort backup process.
  - “Yes!”: Start backup process.
 ⇒ If “Yes!” is selected, a local backup is restored. The counter at menu entry “Progress (0..1000)” shows “1000” when backup has finished.
6. ➤ If you wish to undo the restore process, select menu entry “Undo restore!”.  
⇒ If not undone, the analyzer is set to the restored system settings. If undone, system settings remain unchanged



*By default, some of the functions mentioned in the following procedures are password-protected.*

## Undo Restoring

As long as a configuration has not been overwritten by saving a local backup (↳ “Saving a Local backup” on page 189), restoring can be undone even after finishing a restoring process.

## 9.12 Handling Log Files

Log files are created by the internal data logger, event logger, calibration logger and validation logger. The latter are part of optional software upgrade packages.

The following chapters explain the handling of log files and use the data logger as an example. Other log files are handled accordingly.

## 9.12.1 Configuring Log Files

### Personnel:

- Laboratory researchers
- System integrator

The main task in configuring log files is selecting the type of data to be logged.

1. ➤ Navigate to “System ➔ Setup ➔ Data Logger”.

### Choose entries to log

2. ➤ Select menu entry “Data Selection”.
3. ➤ Change the setting of each menu entry you wish to log to “Yes”.
4. ➤ Change the setting of each menu entry you do not wish to log to “No”

### Choose delimiter

5. ➤



*Entries are separated by a carriage return and line feed.*

Change delimiter between fields in data entries by selecting settings of menu entry “FieldSep.”:

- “TAB” - Tabulator
- “Comma” - Comma
- “SemiKol” - Semicolon

6. ➤ Navigate to “System ➔ Setup ➔ Data Logger”.
7. ➤ Set time interval between logging entries by editing the setting of menu entry “Sample time.”.
8. ➤ Set menu entry “Logging:” to “On” to start logging.

⇒ Data entries of all selected data types (e. g. Concentration, Temperature) are logged at the selected frequency. Fields in the logged data entries are separated by the selected delimiter. Data is logged into cache and every 30 minutes transferred to the internal storage.

At menu entry “Cached entries” the number of entries in cache is displayed. At menu entry “Total entries” the number of entries is displayed that has already been transferred to internal storage.

## 9.12.2 Exporting log files

### Exporting Log Files to USB

### Personnel:

- Laboratory researchers
- System integrator

### Materials:

- USB storage device

1. ➤ Make sure USB device has been prepared  
⇒ “Preparing USB Backup” on page 190.
2. ➤ Navigate to “System ➔ Setup ➔ Data Logger”.
3. ➤ Plug USB storage device into USB-A connector at the backpanel of the device  
⇒ Chapter 2.2.2 “Inputs and Outputs: Data Connectors” on page 20.  
⇒ If the Storage device is detected and accepted “USB” is displayed at the top of the screen.
4. ➤ Select menu entry “Export data to USB!”.  
⇒ Logged data is transferred to the USB storage device.



*Data logger exports data into data.log, event logger into events.log, calibration logger into calibration.log and validation logger into validation.log.*

*Several files of the same type are added by extending the file names with incremental digits, e.g. data001.log, data002.log, ...*

## 9.13 Accessing via Web Browser

### Info on Accessing via Web browser

#### ! NOTICE!

#### **Danger of unauthorized access due to unchanged default passwords!**

Default passwords may be known to others who may then access the analyzer, change settings or read values.

- Change default password after first login.
- Refer to online help of web interface on how to change passwords.



Default user name: **User1**

Default password: **password**

To gain access to the instrument's web browser interface you may connect a PC via network or crossover-cable.

### 9.13.1 Connecting via Network

#### Connecting via Network



*Ethernet1 connector is used to connect to the analyzer via network.*

#### Personnel:

- Laboratory researchers
- System integrator

To connect a PC to the analyzer via an Ethernet connection it may be necessary to enable browser features that were disabled for safety reasons. Contact your local IT.

1. ➤ Connect an RJ45 cable to the network device.
2. ➤ Connect RJ45 cable to ethernet1 connector at the backpanel of the analyzer ➤ *"RJ45 Ethernet Connectors"* on page 24.
3. ➤ Navigate to *"System ➔ Info"*.
4. ➤ Check if an IP address which is displayed at menu entry *"Ethernet1 IP"* is a valid IP address.
5. ➤ If displayed, IP address is not valid, change it as described in ➤ *Chapter 6.2.3.5.2 "Set up Communication Ethernet n"* on page 131.
  - ⇒ IP address is valid and accessible within the desired network.
6. ➤ Connect computer to the network.
7. ➤ Start web browser.
8. ➤ Enter the analyzer IP displayed at menu entry *"Ethernet1 IP"* into the address line of your web browser.
  - ⇒ Connection is established. The web-browser displays a starting screen.

### 9.13.2 Connecting via Crossover Cable



*Ethernet2 connector is used to establish a direct network link between a PC and the analyzer.*

*You must use a crossover cable. Standard RJ45 network cables will not work!*

## Personnel:

- Laboratory researchers
- System integrator

You may need to find out or change the network address of your computer. Refer to the manual provided by the operating system manufacturer on how to change network addresses.

⇒ Connection is established. The web browser displays a starting screen.

1. ➤ Connect crossover network cable to your computer's network device.

2. ➤ Analyzer: Navigate to "System ➔ Info".

3. ➤



*By default, the Analyzer is configured to use IP address 192.168.1.88.*

Check if IP address displayed at menu entry "Ethernet2 IP" is a valid IP address.

4. ➤ If displayed, IP address is not valid, change it as described in ➤ Chapter 6.2.3.5.2 "Set up Communication Ethernet n" on page 131. Use IP address 192.168.1.88.

5. ➤ Analyzer: Navigate to "System ➔ Setup ➔ Communication ➔ Ethernet2".

6. ➤ Make sure, the value of menu entry "Use DHCP:" is set to "No".

7. ➤



*Computer and Analyzer must be in the same network area (i. e. the first three entries of the IP address must be identical.)*

Set your IP address of your computer to 192.168.1.10.

⇒ The analyzer and your computer can be connected via crossover cable.

Analyzer and computer are both located in the same sub-network.

8. ➤ Connect crossover network cable to ethernet2 connector at the backpanel of the analyzer ➤ "RJ45 Ethernet Connectors" on page 24.

9. ➤ Start web browser.

10. ➤ Enter the analyzer IP displayed at menu entry "Ethernet2 IP" (by default 192.168.1.88) into the address line of your web browser.

## 10 Calibration and Validation Procedures

### 10.1 Safety on Calibration and Validation

#### Unauthorized access

#### ! NOTICE!

##### **False measurements due to unauthorized access to calibration procedures!**

Proper configuration and performing of calibrations is essential to keep the functionality of your analyzer. Incorrect calibration may cause false measurements.

- Use access codes to prevent unauthorized access ↗ Chapter 5.3.1 “Access Levels and Codes” on page 60.

#### Order of Calibrations and Validations

#### ! NOTICE!

##### **False measurements due to span calibration without initial zero calibration!**

A zero calibration should always be performed before a span calibration. Span calibrations made without an initial zero calibration may result in false measurements.

### 10.2 Information on Calibration and Validation

#### Difference between Calibration and Validation

When performing a calibration, nominal values are set. All measurements after a calibration are based on these nominal values.

A validation does not set any values. Instead, a validation compares measured values to the nominal values set by calibration. A validation can identify deviations between the nominal values and the values measured during validation process. If no deviations are registered, the measuring capability has been validated.

In some of the following procedures, calibration and validation are not described separately. If you wish to calibrate, use menu entries stating "calibration". If you wish to validate, use "validation".



*If you would like to have the Analyzer calibrated by authorized service personnel, please contact our customer service ↗ Chapter 12.1 “Customer Service” on page 214.*

#### Timers and others Settings



*Some parts of the calibration process are controlled by timers. These timers can be set with software controls. Make sure the timers and other values are appropriate for your special measuring task and your sample gas.*

#### Supplying Gases for Calibrations



*The following calibration procedures require a pure zero gas and a defined span gas to be supplied to the SAMPLE IN connector. If no valve controlled supply is possible, the gases must be connected by hand.*

#### When to calibrate?



*The intervals for calibration depend on the desired accuracy. Once calibrated, the measurement accuracy may drift with time. The longer the interval between two calibration procedures, the higher the possible drift.*

*If high accuracy is mandatory, the analyzer must to be calibrated at least once per day.*

## NO<sub>x</sub> Calibration

To perform NO<sub>x</sub> calibration, switch the analyzer to NO<sub>x</sub> mode and perform zero and span calibration. If the analyzer has already been calibrated in NO mode, then only a span calibration needs to be conducted in the NO<sub>x</sub> mode (and vice versa). The zero calibration between the two modes is shared.

## Manual Calibration/Validation

Typically, a calibration/validation procedure is carried out manually by supplying the gases sequentially by hand and activating the procedures via front panel keys. The operator has to observe purge times and supply the proper gases in correct order.

It is the operator's responsibility to never perform a span calibration without a preceding zero calibration.

## Advanced Calibration/Validation

Advanced calibration/advanced validation is a more comfortable variation of manual calibration/validation, providing ONE KEY calibrations/validations supported by external valves. The analyzer automatically supplies the proper gas and observes purge times.

## Remote Calibration/Validation

Remote calibrations/validations may be activated by means of digital inputs or Modbus commands. Calibrations/validation activated via digital inputs require external valves to be installed. Modbus supports both calibrations/validations with or without valves as well as calibration/validation sequences.

## Unattended Automatic Calibration/Validation

Unattended automatic calibrations/validations are activated utilizing the analyzer software time interval setting.

After a specified time interval has elapsed, the analyzer automatically carries out valve supported zero or span calibrations/validations.

The main advantage is that no user interaction is required to start a calibration/validation or during calibrations/validations: The analyzer automatically supplies the correct gas and considers purge times. The gas analyzer also considers that a span calibration has to be preceded by a zero calibration.



## Access Management



*Configuring and performing calibrations or validations is important to ensure proper analyzer function. For this reason, several calibration and validation-related menus and their submenus can be protected by access codes.*

*In the following step-by-step instruction, this manual does not state when to enter access codes.*

*For information on how calibration or validation related menus can be protected by access code:*

-  Chapter 6.2.2 “Control Menu” on page 80
-  Chapter 6.2.3 “Setup Menu” on page 92

## 10.3 Preparing Calibration or Validation

### Before Starting Calibration or Validation

Calibrations and validation are automatic processes that are carried out after a manual or automatic triggering command. It is important to prepare gas connections and analyzer settings before triggering. Depending on your individual settings, you may have to enter access codes at some point.

### Calibration Deviation Tolerance Check

With the calibration deviation tolerance check enabled during calibration, the analyzer compares the currently measured concentration to the expected value, as set up in “System → Setup → Calibration/Validation → Gases”.



If the measured concentration differs from the expected values by more than the percentage of measuring range with respect to the span gas value given in the menu “*Tolerances*” calibration is aborted and a maintenance request alarm is set:

- A symbol is displayed
- An error message is displayed
- A relay output is triggered (optional)

Resetting the alarm requires performing a valid calibration, and to acknowledge the error message within “*System → Control → Acknowledgements*”.

Unacknowledged maintenance requests are stored even if the Analyzer is switched off and on again. In addition: If, for example, a calibration was aborted because of a tolerance check, the maintenance request will still be active. If the operator does not acknowledge the request and performs a new calibration, now with disabled tolerance check, the earlier maintenance request is stored and re-activated again, when the tolerance check is enabled somewhere in the future!

The tolerance check helps to avoid calibration using the wrong gas (e.g. starting a span calibration while zero gas is flowing). Registering deviations from the expected values, it so helps maintaining measuring capability.



*There are situations, when the calibration deviation tolerance check must be disabled, e.g. during first time calibration.*

*By default, the calibration deviation tolerance check is disabled (“Off”).*

## Setting up gas concentrations, tolerances and analog output behavior

### Personnel:

- Laboratory researchers
- System integrator

### Entering gas concentrations

1. ➤ Navigate to “*System → Setup → Calibration/Validation → Gases*”.
2. ➤ Select menu entry “*Zero Gas*”.



*The units for the calibration/validation gases are taken from the related entry in the display setup menu.*

3. ➤ Enter the concentration value for the zero gas to be used during zero calibration and zero validation.
  - ⇒ The entered value is displayed next to the menu entry “*Zero Gas*”.
4. ➤ Select menu entry “*Span Gas*”.
5. ➤ Enter the concentration value for the span gas to be used during span calibration and span validation.
  - ⇒ The entered value is displayed next to the menu entry “*Span Gas*”.

### Entering tolerance values

6. ➤ Navigate to “*System → Setup → Calibration/Validation → Tolerances*”.
7. ➤ Enter tolerance values for validation gases (“*ZeroValidTol*” and “*SpanValidTol*”).
  - ⇒ The entered tolerance values are displayed next to the corresponding menu entry.
8. ➤ Enter tolerance values for calibration gases (“*ZeroCalTol*” and “*SpanCalTol*”).
  - ⇒ The entered tolerance values are displayed next to the corresponding menu entry.

9. ➤

### ! NOTICE!

Do not turn on calibration deviation tolerance check during first time calibration.

If desired, turn calibration deviation tolerance check (☞ “Calibration Deviation Tolerance Check” on page 197) on or off.

## Setting Analog Outputs



*If you use analog output signals, you may want to check or setup, how the analog signals proceed during calibrations or validations.*

10. ➤ To check analog signal behavior, navigate to “System ➔ Setup ➔ In/Outputs ➔ Analog Outputs”
11. ➤ Select the desired output by selecting the appropriate menu entry.
  - ⇒ Signal behavior is displayed for the selected output.
12. ➤ Set menu entry “Hold” to “yes” in order to:
  - Set analog output to the last measured value.
  - Suppress concentration alarms which may otherwise be triggered by the concentrations of the calibration gases.
13. ➤ Set menu entry “Hold” to “no” in order to:
  - make the analog output always correspond to the actual measured value.
  - Activate the alarm functionality for exceeding limits.
  - ⇒ All analog outputs have now been set.

## Setting up timers

Non-manual calibration/validation procedures require timers. These timers control time spans during calibration process e. g. the time for purging gas lines with calibration gas.

Timers always have to be set in a way such that the time interval is sufficient for the task. If you set the timer for purging gas lines, make sure that the remaining sample gas is fully driven out of the SAMPLE IN gas line. Same is valid for span calibration(s).

Since on-site conditions differ, no suitable values can be stated in this manual. Calculate your individual value on the basis of pressure, and gas line properties.

## 10.4 Performing Manual Calibration and Validation

### 10.4.1 Performing Manual Calibration

#### Manual Zero Calibration

##### Personnel:

- Laboratory researchers
- System integrator


##### Protective equipment:

- Safety gloves
- Safety shoes

##### Materials:

- Zero gas supply (N<sub>2</sub>)

1. ➤ If NO concentration in zero gas is other than 0 ppm, define exact concentration of NO in software ☞ Chapter 10.3 “Preparing Calibration or Validation” on page 197.
2. ➤ Make sure the Analyzer has already heated up and no temperature related error messages are displayed.
3. ➤ Make sure zero gas supply is connected correctly.
4. ➤ Apply the required zero gas according to specifications:
  - ☞ “Consumable Materials” on page 19
  - ☞ Chapter 3.1.4 “Gas Supply Data” on page 46
5. ➤ Supply zero gas to the SAMPLE IN gas path.
6. ➤ Make sure zero gas is applied and flowing.
7. ➤ Navigate to “System ➔ Control ➔ Calibration ➔ Zero Calibration”
8. ➤
 



*Calibration process may be aborted by selecting menu entry “Cancel!”.*

Select Menu entry “Start!”.

  - ⇒ Timers are displayed and the zero gas purges residual sample gas. Calibration is performed automatically.
9. ➤ Wait until the calibration results are shown on the display.

- ⇒ If zero calibration was successful, a span calibration must be performed. If zero calibration was not successful, repeat procedure and consider adjusting timers (e. g. for purging) or using zero gas of higher quality.

## Manual Span Calibration

### Personnel:

- Laboratory researchers
- System integrator

### Protective equipment:

- Safety gloves
- Safety shoes

### Materials:

- Span gas supply

1. ➤ Make sure a successful zero calibration has been performed.
2. ➤ Define exact NO concentration of span gas in software ➤ *Chapter 6.2.3.2.1 "Set up Calibration and Validation Gases" on page 103.*
3. ➤ Make sure span gas supply is connected properly.
4. ➤ Apply the required span gas according to specifications:
  - ➤ *"Consumable Materials" on page 19*
  - ➤ *Chapter 3.1.4 "Gas Supply Data" on page 46*
5. ➤ Establish span gas supply at SAMPLE IN-connector.
6. ➤ Navigate to "System ➔ Control ➔ Calibration ➔ Span Calibration"



*Calibration process may be aborted by selecting menu entry "Cancel!".*

7. ➤ Select menu entry "Start!".
  - ⇒ Timers are displayed and the span gas purges residual zero gas. Calibration is performed automatically.
8. ➤ Wait until the calibration results are shown on the display.
  - ⇒ If span calibration was successful, a corresponding message is displayed. If span calibration was not successful, repeat procedure and consider adjusting timers (e. g. for purging) or a different span gas.

## 10.4.2 Performing Manual Validation

### Manual Zero Validation

#### Personnel:

- Analyzer operator

#### Protective equipment:

- Safety gloves
- Safety shoes

#### Materials:

- Zero gas supply (N<sub>2</sub>)

1. ➤ Make sure the Analyzer has already heated up and no contrary messages are displayed.
2. ➤ Make sure zero gas supply is connected correctly.
3. ➤ Apply the required zero gas according to specifications:
  - ↗ *“Consumable Materials” on page 19*
  - ↗ *Chapter 3.1.4 “Gas Supply Data” on page 46*
4. ➤ Supply zero gas to the SAMPLE IN gas path.
5. ➤ Navigate to *“System → Control → Validation → Zero Validation”*.
6. ➤ Make sure zero gas is applied and flowing.
7. ➤ Use zero gas to purge gas line. Remaining sample gas must be fully removed.
8. ➤ Make sure the intended concentration values for Zero gas and Tolerance (*“ZeroValidTol+-”*) are displayed. If not, redefine them ↗ *Chapter 6.2.3.2 “Calibration and Validation Setup Menu” on page 103*.



*Validation process may be aborted by selecting menu entry “Cancel!”.*

9. ➤ Select menu entry *“Start!”*.
  - ⇒ Validation process starts.
10. ➤ Select menu entry *“Status..”* to display information about validation process.
  - ⇒ Remaining time, concentrations and further information on the validation process is displayed.
11. ➤ Select menu entry *“Results..”* to display Validation results.

- ⇒ Status and date of the latest validation are displayed. The menu entries *“ZeroValidDev”* and *“SpanValidDev”* show deviations from the nominal values determined by the last successful validation procedure.

When validation procedure has completed successfully, the displayed dates for *“Zero date”* and *“Span date”* change to current day.

## Manual span validation

### Personnel:

- Analyzer operator

### Protective equipment:

- Safety gloves
- Safety shoes

### Materials:

- Span gas supply

1. Make sure a zero validation has been completed successfully.
2. Make sure span gas supply is connected correctly.
3. Apply the required span gas according to specifications:
  - [“Consumable Materials” on page 19](#)
  - [Chapter 3.1.4 “Gas Supply Data” on page 46](#)
4. Supply span gas to the SAMPLE IN gas path.
5. Navigate to “System → Control → Validation → Span Validation”.
6. Make sure span gas is applied and flowing.
7. Make sure the intended concentration values are displayed. If not, redefine them [Chapter 6.2.3.2 “Calibration and Validation Setup Menu” on page 103](#).



Validation process may be aborted by selecting menu entry “Cancel!”.

8. Select menu entry “Start!”.
  - ⇒ Validation process starts.
9. Select menu entry “Status..” to display information on validation process.
  - ⇒ Remaining time, concentrations and further information on the validation process is displayed.
10. Select menu entry “Results..” to display Validation results.
  - ⇒ Status and date of the latest validation are displayed. The menu entries “ZeroValidDev” and “SpanValidDev” show deviations from the nominal values determined by the last successful validation procedure.

When Validation procedure has completed successfully, the displayed “Span date” changes to current day.

## 10.5 Performing Non-Manual Calibration

### 10.5.1 Supplying Calibration and Validation Gases

#### External valves

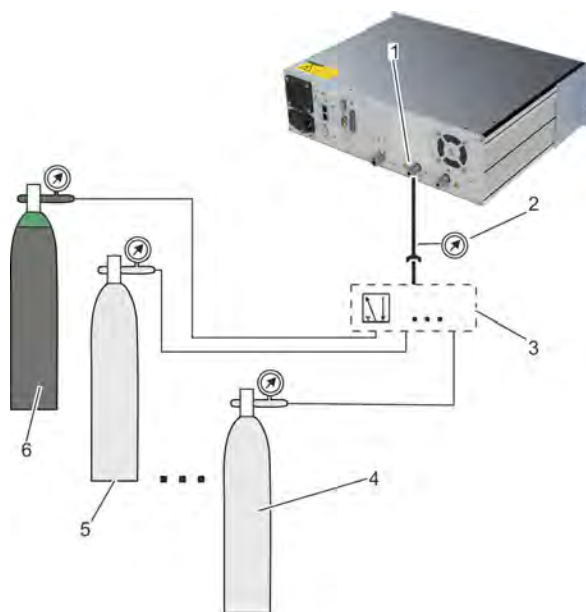


Fig. 102: Valve controlled gas supply

- 1 SAMPLE-IN
- 2 Pressure gauge
- 3 Valves
- 4 Span gas supply (Range 4)
- 5 Span gas supply (Range 1)
- 6 Zero gas supply

Automatic calibration procedures require the possibility to automatically supply zero gas and span gas(es). The Analyzer does not offer internal valves so external valves have to be used. However the signals to trigger valves may be generated by the analyzer.



If different gas concentration ranges are to be measured, it may be necessary to implement multi-port valves.

## 10.5.2 Assigning Digital Outputs to External Valves

### Information on Assigning Outputs to Valves

If your analyzer needs to control external valves, first check if all valves required for calibration or validation are connected to digital outputs.

Open “System → Setup → In/Outputs → Digital Outputs” to assign the valves to the outputs.

Digital Outputs (X1)	
Output1 Node:	System
Output1 Signal:	Off
Output2 Node:	System
Output2 Signal:	Off
Output3 Node:	System
Output3 Signal:	Off
Output4 Node:	System
▼Output4 Signal:	Off

Fig. 103: Digital Outputs (X1)

This menu allows to configure the digital outputs. All outputs (default and optional) support the same range of signals/functions. Outputs 1 to 4 are available in every unit, and by default, set up to provide NAMUR signals.

Further pages are indicated by a down arrow, only when the extension card (outputs 5 to 13) is installed.

Digital Outputs (X4.1) 1of3	
Output5 Node:	System
Output5 Signal:	Off

Digital Outputs (X4.1) 2of3	
Output8 Node:	System
Output8 Signal:	Off

Digital Outputs (X4.1) 3of3	
Output11 Node:	System
Output11 Signal:	Off
Output12 Node:	System
Output12 Signal:	Off
▼Output13 Node:	System
▼Output13 Signal:	Off

Fig. 104: Digital Outputs (Extension)

Outputs 5 to 13 are present on the extension card labelled X4.1.

Verify which digital outputs are connected to control your external valves, and how the valves are labelled.

Enter the menu page, showing these outputs, and for each output select “System” in the line “OutputX Node” (where “X” is replaced by the output number).

Digital Outputs (X4.1) 1of3	
Output5 Node:	System
Output5 Signal:	V5
Output6 Node:	System
Output6 Signal:	V6
Output7 Node:	System

Fig. 105: Digital output setting (example)



## Example setting

In this example we assume that the analyzer controls three external valves.

Three external valves are labelled V5 ... V7 and connected to digital outputs 5 .. 7.

In order for this to be set up, enter the second page of the Digital Outputs menu, and for each output 5 .. 7 select System for the "... Node".

The next step is to assign the valves.

## Assigning Outputs to Valves

### Personnel:

- Laboratory researchers
- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

If one valve is used for multiple measuring ranges, take care that this requires to specify the same calibration/validation gas concentration for all these ranges!



*One valve = One calibration/validation gas*

1. ➤ Navigate to "System ➔ Setup ➔ Calibration/Validation ➔ Valve Assignment".
2. ➤ On the first menu page:  
Set sample valve and zero valve.
3. ➤ Set purge times for sample valve and zero valve.  
⇒ If menu entry "Correct assign" displays "Yes", assignment is correct. If "No" is displayed, then reassign valves.
4. ➤ Navigate to the second menu page.

5. ➤



*Depending on the gas analyzer and SHS configuration, it is possible to assign a specific valve to multiple ranges.*

Assign up to four different valves by editing the corresponding menu entry "SpanX valve" where X is the number of the span gas supply.

⇒ All desired span gas supplies are assigned to a valve.

6. ➤ If desired, set purge time for the assigned valves by editing the corresponding "Purge time" entry.  
⇒ Purge times have been set.
7. ➤ Navigate to the third menu page.
8. ➤ Assign blowback valve if desired by editing the entry "Blowback valve".

9. ➤ Return to the the first menu page.
10. ➤ Make sure menu entry “Correct assign” displays “Yes”.
  - ⇒ If “Yes” is displayed, no valve has been assigned more than once. If “No” is displayed, at least one valve has to be reassigned.

## 10.5.3 Valve Assignment for Valve Supported Calibrations and Validations

### Why Assign Valves?

As described earlier, several calibration and validation procedures require installed external valves.

In addition, this requires all requested calibration and validation gases to be connected to the valves and the valves to be assigned to the gases via software commands.

### Valve usage settings



Since the analyzer does not offer internal valves, the options “External” and “Int+Ext” are identical.

Option	Effect
“None”	External valves are not supported.
“External”	External valves can be assigned.
“Int+Ext”	XECLD: External valves can be assigned.

### Why is the assignment of valves required?

For valve supported calibrations and validations, the analyzer controls the gas flow, and therefore needs to ‘know’ about the different valve functions - this is done by valve assignment.

In addition, variable valve assignment allows to use one valve for different functions.

### Personnel:

- Laboratory researchers
- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

Before starting to assign valves to gases and channels, check if valves are supported.

1. ➤ Navigate to “System ➔ Setup ➔ Installed Options”
2. ➤ Select menu entry “Valves”.
3. ➤ Select “None” to disable external valve controlling.



Since XECLD does not offer an option for internal valves, the settings “External” and “Int+Ext” are identical.

4. ➤ Select “External” or “Int+Ext” to enable external valve assignment.
  - ⇒ If external valves have been activated, they must be assigned to digital outputs .

## 10.5.4 Performing Advanced Calibration

### Why Perform Advanced Calibration

Manual validation offers limited functionality. For a full manual calibration, the operator has to manually start two procedures. In addition, he has to stay near the analyzer to check for error messages and observe when zero calibration has finished. Only then he can manually start the span calibration.

To improve manual validation procedures, the analyzer offers advanced calibration. After a manual trigger command, all further steps are performed automatically.

### Advanced Calibration for All Channels

The Analyzer offers one-channel operation only. Some calibration processes are identical even though they can be executed via different menu entries.

In the “Advanced Calibration” menu the menu entries “Zero&Span Single” and “Zero&Span All!” trigger one and the same calibration process.

“Zero All!” and “Span All!” trigger an automatic process that sets nominal values as manually triggered zero-calibration and span-calibration.

## Performing Advanced Calibration

### ! NOTICE!

Always zero-calibrate before span-calibrating.

### Personnel:

- Laboratory researchers
- On-site service technician

### Protective equipment:

- Safety gloves
- Safety shoes

Advanced calibration is triggered manually. After the triggering command, all steps are performed automatically if the analyzer is configured correctly.

1. ➤ Make sure the Analyzer has already heated up and no error messages are displayed.
2. ➤ Make sure all gas lines are connected correctly and are tight.
3. ➤ Make sure all external valves are functional and assigned as desired ➤ *Chapter 10.5.2 “Assigning Digital Outputs to External Valves” on page 203.*
4. ➤ Navigate to “System ➔ Control ➔ Calibration ➔ Advanced calibration”
5. ➤ To perform zero-calibration only, select menu entry “Zero All!”.
  - ⇒ Zero-calibration is being performed and current action as well as timers are displayed. After a successful calibration a corresponding message is displayed.
6. ➤ To perform span-calibration only, select menu entry “Span All!”.
  - ⇒ Span-calibration is being performed and current action as well as timers are displayed. After a successful calibration a corresponding message is displayed.
7. ➤



*Both functions are identical.*

To perform both zero-calibration and span calibration, select either “Zero&span single” or “Zero&span all!”.

- ⇒ Span-calibration and zero-calibration are being performed and current action as well as timers are displayed. After a successful calibration a corresponding message is displayed.

## 10.5.5 Performing Remote Calibration/Validation

### Digital Input and Modbus Input



*Digital inputs are available optionally.*

Remote calibrations/validations may be initialized by digital inputs or Modbus commands, whereas both offer different functionalities. For further information on Modbus, refer to the appropriate manual [Modbus manual](#).

### Remote Calibration/Validation via Digital Input

Remote calibration/validation via digital inputs is possible only in combination with external valves. This option is limited to three procedures where each can be assigned to any digital input:

- Zero calibrate/validate all channels
- Span calibrate/validate all channels
- Zero & span calibrate/validate all channels

A signal edge is detected after 300 to 500 ms. If no change in signal occurs within 500 ms after detection, the signal will be accepted.

Furthermore, be aware that:

- Calibrations/validations can only be canceled by an appropriate digital input signal or command, but not by another calibration/validation trigger signal.
- Edge detection time slots of input signals must start after the ongoing procedure has ended.

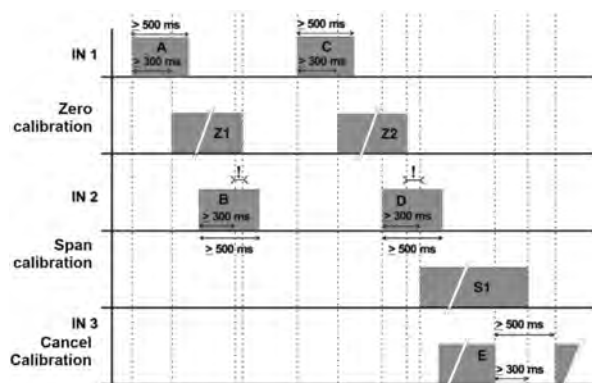


Fig. 106: An example of signal timing

### An example of signal timing

During an ongoing zero calibration/validation, an input signal to start a span calibration/validation for the same channel should be applied after the zero calibration/validation has finished.

At least it must be applied in a way such that the 300 to 500 ms edge detection time slot starts after the zero calibration/validation has ended (Fig. 106/signal D), otherwise it is rejected (Fig. 106/signal B).

### Remote Calibration via Digital Inputs



*Make sure all trigger signals are given only after the preceding procedure has finished.*

### Personnel:

- Laboratory researchers
- System integrator

For a description of available options: [Chapter 6.2.3.4.5 "Set up Digital Inputs" on page 127](#)

### 1.



*The first 3 menu pages allow to configure inputs 1 – 7 which are available on the expansion board (X4.1). Each Input can be assigned and configured individually.*

Navigate to "System → Setup → In/Outputs → Digital Inputs"

### 2.

Repeat the following four steps until all desired digital inputs are configured and assigned.

### 3.

If inputs are disabled, enable them via menu entry "Inputs Enabled".

### 4.

Choose node option for the desired input at the corresponding menu entry "InputX Node".

### 5.

Assign input function at menu entry "InputX Function".

### 6.

Select input edge behavior at menu entry "InputX Edge".

⇒ All digital inputs are configured and assigned.

## Remote Calibration via Modbus Interface

The Modbus interface offers more variability in performing calibrations/validations. You can perform remote calibration/validation with or without valves.

When performing calibration/validation without valves the Modbus command initializes the procedure within the Analyzer you have to manually take care that the gases are supplied in proper order and you will have to consider suitable purge times. Also you have to make sure never to perform a span calibration/validation without a preceding zero calibration/validation. In this configuration, Modbus may be used e.g. together with an external sample handling system that controls the gas flow.

Using valves, you have two different possibilities for remote calibration via Modbus interface:

- Perform single calibrations/validations
- Perform special calibration/validation procedure: Zero & span calibrate/validate

Initialized by the Modbus command the analyzer performs above mentioned procedures and controls gas supply, purge times and performs a zero calibration/validation for the last given procedure before activating span calibrations/validations.

## Modbus Activated Calibrations/Validations Without Valves

Several Modbus commands allow to start calibrations/validations.

If the analyzer does not provide digital inputs and outputs (for controlling external valves), then the procedure corresponds to the manual calibration/validation, with the Modbus commands replacing the manual front panel button key controls.

This means the Modbus command immediately starts the calculation. The operator has to ensure in this moment, the proper gas is applied and the measuring system is filled with calibration/validation gas. If applicable, he also has to take care to not activate a span calibration/validation without a preceding zero calibration/validation.

Also see:

- Performing manual calibration: ↗ *Chapter 10.4.1 "Performing Manual Calibration" on page 199*
- Performing manual validation: ↗ *Chapter 10.4.2 "Performing Manual Validation" on page 201*

## Modbus Activated Calibrations/Validations With Valves

Several Modbus commands allow to start calibrations/validations.

If the analyzer provides digital outputs (for controlling external valves), then Modbus commands allow to make use of all the options of advanced calibration ↗ *Chapter 10.5.4 "Performing Advanced Calibration" on page 205* with the Modbus commands replacing the manual front panel button key controls.

This means Modbus commands can initialize the following processes:

- Zero calibrations/validations
- Span calibrations/validations
- Zero and span calibrations/validations

The analyzer controls the gas flow and takes care to not activate a span calibration/validation without a preceding zero calibration/validation.

## 10.5.6 Performing Unattended Calibration/Validation

### Information on Unattended Calibration/Validation

The unattended automatic calibration/validation feature allows to program the analyzer to automatically perform valve supported calibration/validation procedures without the need of digital inputs or Modbus interface connections.

Compared to the procedures described in the section before (advanced calibration/validation), there are only very limited options, comparable to the manual calibration/validation procedures: The operator has the simple choice of programming zero, or zero and span calibration/validation intervals.

The main features compared to advanced calibrations/validations are that:

- An interval time specifies the time between two calibrations/validations.
- Starting and processing calibrations/validations does not require operator interaction.
- For span calibrations/validations the analyzer considers the requirement, that a zero calibration/validation always has to be carried out first.

## Types of Interval Times

Interval times in menu entries of “System → Setup → Calibration/Validation” differ as follows:

Menu entry	Meaning
“ZeroCal all..”	This entry specifies intervals for zero calibrations only.  If “Zero&SpanCal all..” is also set, the Analyzer will carry out zero calibrations based on the “Zero&SpanCal all..” interval. The entry in “ZeroCal all..” will be overwritten.
“Zero&SpanCal all..”	This is the interval to elapse before the analyzer automatically starts a full calibration procedure, consisting of a zero calibration followed by a span calibration.
“Programmed sequence..”	This is the interval time for the sequence, setup in “System → Setup → Calibration/Validation → Program sequence”
“Blowback All”	To blowback at regular intervals, enter this submenu.
“ZeroValid All..”	This entry specifies intervals for zero validations only.  If “Zero&SpanValid All..” is also set, the Analyzer will carry out zero validation based on the “Zero&SpanValid all..” interval. The entry in “ZeroVal all..” will be overwritten.


Menu entry	Meaning
“Zero&SpanValid All..”	This is the interval to elapse before the analyzer automatically starts a full validation procedure, consisting of a zero validation followed by a span validation.

### Personnel:

- Authorized service personnel
- System integrator

To perform unattended calibration, interval times have to be set. All menu entries of “System → Setup → Calibration/Validation” include the same submenu entries.

1. ➤ Navigate to “System → Setup → Calibration/Validation → Interval times..”
2. ➤ Select the desired menu entry, e. g. “ZeroCal All..” .
3. ➤ Set the menu entry “Enable:” to “Enabled” to use interval times for the selected menu entry.  
⇒ Timer is activated.
4. ➤ 

  
Accepted rage: 1 .. 10.000 h

Enter the desired interval time (h) in menu entry “Interval:”.  
⇒ Interval in hours between two processes is set. The first execution of selected procedure is not yet set.
5. ➤ Enter time and date for first execution of selected procedure in menu entry “Start time..”  
⇒ Starting time is displayed. Menu entry “Next:” displays time and date of the following execution of selected procedure. Timers have been set.



## 10.6 Performing NO- and NO<sub>x</sub> Calibration

### Calibration for NO- and NO<sub>x</sub> mode

The Procedures of NO- and NO<sub>x</sub> calibration are identical. The calibration is always performed for the activated measuring mode, i. e. NO- or NO<sub>x</sub> mode. If the analyzer is used to measure only NO or only NO<sub>x</sub> a zero and a span calibration have to be performed for the desired mode. If both (NO and NO<sub>x</sub>) are to be measured, it is possible to use one zero calibration for both measuring modes. Span calibration has to be performed individually for each measuring mode and concentration range.



*Depending on concentration ranges, it is possible to use the same span gas(es) for both modes.*

*Only use NO for calibrating NO<sub>x</sub> mode.*

### Performing Calibration in the Activated Measuring Mode

#### Personnel:

- Laboratory researchers
- System integrator

To perform a calibration, the desired measuring mode has to be activated. Only the activated measuring mode is calibrated.

The following sequence shows an example for calibration in NO<sub>x</sub> mode.

1. ➤ Navigate to "System ➔ Control ➔ NO/NO<sub>x</sub> Mode"
2. ➤ Activate NO<sub>x</sub> mode by selecting the corresponding menu entry "NO<sub>x</sub>".

- ⇒ NO<sub>x</sub> measuring mode is activated.  
When performing a span calibration, only the nominal values for NO<sub>x</sub> mode are set.

3. ➤



*If zero-calibration has already been successfully performed for NO mode, you may skip the zero calibration.*

Perform the desired zero calibration.

- ⇒ Analyzer is freshly zero-calibrated otherwise the nominal values from the zero calibration of NO mode are also used for NO<sub>x</sub> calibration.

4. ➤ Perform the desired span calibration.

- ⇒ The analyzer is fully calibrated in NO<sub>x</sub> mode.



*After successful NO<sub>x</sub> calibration, make sure the converter is properly adjusted for measuring NO<sub>x</sub>.*

## Performing calibration for both measuring modes

An automatic calibration for both NO- and NO<sub>x</sub> mode can be setup via program sequence  
 ↳ Chapter 6.2.3.2.8 “Set up Calibration and Validation Program Sequence” on page 108.  
 Changing from NO mode to NO<sub>x</sub> mode must be defined as a separate software step. The software step mode change does not include any purge time. For this reason a 'Wait' step should always follow a mode change step (i. e. "NO mode" or "NO<sub>x</sub> mode").

### Example of a program sequence

Program Sequence 1 of 8	
▲ Action1:	NO mode
Node1:	All
Action2:	Wait
Node2:	All
Action3:	ZeroCal
Node3:	Ch1
Action4:	SpanCal
▼ Node4:	Ch1

Program Sequence 2 of 8	
▲ Action5:	NO <sub>x</sub> mode
Node5:	All
Action6:	Wait
Node6:	All
Action7:	SpanCal
Node7:	Ch1
Action8:	END-OF-PGRM
▼ Node8:	All

## 11 Troubleshooting

### 11.1 Troubleshooting Safety

#### Dangers when troubleshooting



#### **WARNING!**

#### **Danger of injuries due to lack of qualification!**

If troubleshooting tasks not described in this manual are performed without the necessary knowledge, dangerous situations may arise.

- Do not perform troubleshooting tasks not described in this manual.
- Contact manufacturer for troubleshooting tasks not described in this manual.

## 11.2 Possible Wear-Related Replacements



*Perform the following wear-related replacements only if the relevant part is worn or damaged.*

Maintenance work	Personnel
Replace ozonator Contact customer service	Authorized service personnel
Replace EPVs (non-air) Contact customer service	Authorized service personnel
Replace certain PCBs Contact customer service	Authorized service personnel
Replace flow sensors of Ozonator Contact customer service	Authorized service personnel
Replace pressure sensors Contact customer service	Authorized service personnel

## 12 Service Information

### Technical Assistance

If you need technical assistance with the Analyzer, please contact the manufacturer:

Emerson Process Management GmbH & Co.  
OHG  
Process Gas Analyzer Center of Excellence  
Industriestraße 1  
63594 Hasselroth  
Germany  
Phone: +49 6055 884 0  
Fax: +49 6055 884 209  
Email: [gas.csc@emerson.com](mailto:gas.csc@emerson.com)  
WWW: [Emerson.de](http://Emerson.de)

### Asia Pacific

Emerson Process Management  
Asian Pacific Pte Limited  
1 Pandan Crescent  
Singapore 128461  
T: +65-6-777-8211

## 12.1 Customer Service

### Scope of Services

Our Customer Service can help you out with the following topics:

- order administration
- replacement parts
- application assistance
- on-site or factory repair
- service or maintenance

### USA

Emerson Process Management  
Rosemount Analytical Inc.  
Customer Service Center  
T: +1-800-433-6076  
T: +1-800-914-1261

### Europe

Emerson Process Management GmbH & Co.  
OHG  
Service Department  
Germany  
T: +49 6055 884-470/-472

## 13 Glossary

### **NAMUR**

NAMUR is an international user association of automation technology in process industries. This organisation has issued experience reports and working documents, called recommendations (NE) and worksheets (NA).

### **Analyzer Module**

The module that contains all sensor/detector components for development of a raw signal value which is the basis for the derivation of the Primary Variable; it includes signal conditioning and temperature control circuitry.

### **Control Module**

The module that provides all features and interfaces of the XE platform to the XECLD; it consists of the PCBs in the card cage and the LOI and provides the Primary Variable.

### **I/O Module**

Optional I/O modules providing analog or digital inputs/outputs.

### **Raw Signal**

Conditioned detector signal from the Analyzer Module; the basis for the Primary Variable.

### **Primary Variable**

The measured species concentration value; calibrated and compensated.

### **Secondary Variable**

Data placed on the network by a module regarding the current status, e.g. temperatures and pressures.

### **Explosive Gas(es)**

Gases and mixtures are assigned to be explosive when within the explosive limits in a mixture with air.

### **Flammable Gas(es)**

Gases and gas mixtures are assigned to be flammable if they might become ignitable when in a mixture with air.



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## **Appendix**

# A Potentially Poisonous Substances

## Ozone (O<sub>3</sub>)

The device itself generates Ozone (O<sub>3</sub>) in potentially poisonous amounts. Ozone (O<sub>3</sub>) may be harmful if breathed in.

## NO and NO<sub>x</sub> in Exhaust Fumes

Exhaust fumes may contain NO and NO<sub>x</sub> and other potentially harmful components.

## Other Exhaust Fume Fractions

Besides NO and NO<sub>x</sub> exhaust fumes may contain other potentially harmful fractions. Please fully analyze your exhaust fumes to gain knowledge about these fractions and to derive proper (safety) measures.

## **B PLC Quick Reference Card**

## PLC Quick Reference Card

**Program lines not to exceed 100 chars, otherwise runtime errors show up!**

**First program line to start with #####, otherwise upload to analyzer fails!**

If timers need to be used, they have to be setup at the beginning of the program (see [Example Program](#))

For USB transfer save PLC.TXT on the USB stick into the directory

emerson\_xe\<Analyzer Serial Number>\config

### PLC Timer Setup

Syntax: <COMMAND> <ID> <VALUE>; [Comment]

For details see [Timer Modes](#) below

COMMAND	ID	VALUE
TMR_MODE	1...8	OFFDELAY, ONDELAY, REPPULSE, SINGLEPULSE, RETRIGSPULSE, INHIBSPULSE, CLKTRGPULSE, COUNTER
TMR_DURATION	1...8	1...3600
TMR_PERIOD_CNT	1...8	1...3600 (REPPULSE: sec CLKTRGPULSE: min COUNTER: counts)
TMR_TRIG_TIME	1...8	YYYY,MM,DD,hh,mm

### Sequencer Setup

Syntax: <COMMAND> <ID> <VALUE>; [Comment]

For details see [Sequencer Function Block](#) below

COMMAND	ID	VALUE	DESCRIPTION
SEQ_DURATION	1...4	1...3600	Set switch duration
SEQ_STAB_TIME	1...4	0...3599, but max. ( <SEQ_DURATION> -1)	Set stabilization time
SEQ_NUM_OUTS	1...4	2...10	Set no. of outputs to be used
SEQ_SNGL_CYCLE	1...4	TRUE, FALSE	Set single cycle mode

### Programming Quick Reference

Syntax: <OPERATOR> [<OPERAND>, <OPERAND>, ...]; [Comment]

Maximum amount of operators & operands: approx. 400

SPECIAL CHARACTER	Function
,	Separation of Operands
;	Command Termination
#	Start of Comment Line

OPERATOR	OPERANDS	Description
<b>CLR</b>	-	Set register to FALSE
<b>SET</b>	-	Set register to TRUE
<b>AND</b>	O1, [O2, O3, ...]	Logical AND of register and <read operands>
<b>OR</b>	O1, [O2, O3, ...]	Logical OR of register and <read operands>
<b>NEG</b>	-	Negate register
<b>LOAD</b>	O1	load register with state of <read operands>
<b>STO</b>	O1, [O2, O3, ...]	Store register to <write operands>
<b>IF</b>	O1, O2	if register = TRUE then load register with state of first <read operand> else load register with state of second <read operand>
<b>CALL</b>	O1, [O2, O3, ...]	if register = TRUE then call <call operand>
<b>END</b>	-	End of program

READ & WRITE OPERANDS	Description
<b>R1 ... R10</b>	Result 1 ... 10
<b>M1 ... M15</b>	Memory 1 ... 15

WRITE ONLY OPERANDS	Description
<b>T1I1, T1I2</b>	Timer 1 / Input 1, 2
<b>T2I1, T2I2</b>	Timer 2 / Input 1, 2
<b>T3I1, T3I2</b>	Timer 3 / Input 1, 2
<b>T4I1, T4I2</b>	Timer 4 / Input 1, 2
<b>T5I1, T5I2</b>	Timer 5 / Input 1, 2
<b>T6I1, T6I2</b>	Timer 6 / Input 1, 2
<b>T7I1, T7I2</b>	Timer 7 / Input 1, 2
<b>T8I1, T8I2</b>	Timer 8 / Input 1, 2
<b>SQ1ENA, SQ1HLD, SQ1RST</b>	Sequencer 1 / Enable, Hold, Restart
<b>SQ2ENA, SQ2HLD, SQ2RST</b>	Sequencer 2 / Enable, Hold, Restart
<b>SQ3ENA, SQ3HLD, SQ3RST</b>	Sequencer 3 / Enable, Hold, Restart
<b>SQ4ENA, SQ4HLD, SQ4RST</b>	Sequencer 4 / Enable, Hold, Restart

Syntax of channel related operands indices: <CHANNELNUMBER><SIGNALNUMBER>

READ ONLY OPERANDS	Description
<b>S01 ... S76</b>	System Digital Output Pool (see <a href="#">below</a> )
<b>S101 ... S540</b>	Channel Digital Output Pool (see <a href="#">below</a> )
<b>T1 ... T8</b>	Output Timer 1 ... 8
<b>SQ1O1 ... SQ1O10, SQ1RDY, SQ1STAB</b>	Sequencer 1 / Outputs 1...10, Ready, Stabilize
<b>SQ2O1 ... SQ2O10, SQ2RDY, SQ2STAB</b>	Sequencer 2 / Outputs 1...10, Ready, Stabilize
<b>SQ3O1 ... SQ3O10, SQ3RDY, SQ3STAB</b>	Sequencer 3 / Outputs 1...10, Ready, Stabilize
<b>SQ4O1 ... SQ4O10, SQ4RDY, SQ4STAB</b>	Sequencer 4 / Outputs 1...10, Ready, Stabilize
<b>DI1 ... DI14</b>	Digital Input 1 ... 14
<b>PU1, PU2</b>	Pump State 1, 2
<b>TRUE</b>	Logical TRUE operand
<b>FALSE</b>	Logical FALSE operand



CALL ONLY OPERANDS	Description
A01 ... A15	System Actions (see <a href="#">below</a> )
A101 ... A521	Channel Actions (see <a href="#">below</a> )

## System Actions Pool Index

Usage example: CALL A06; # Start programmed sequence if register changed to TRUE

ANR	Description
01	None
02	Zero All
03	Span All
04	Zero&Span All
05	Cancel All
06	ProgSequ
07	Blowback
08	CalCheckMod
09	Reserved
10	Failure
11	OffSpec
12	MaintRequ

ANR	Description
13	FctCheck
14	Pump1
15	Pump2
16	Ext Alarm1
17	Ext Alarm2
18	Ext Alarm3
19	Ext Alarm4
20	Ext Alarm5
21	Ext Alarm6
22	Ext Alarm7
23	Ext Alarm8

## System Digital Output Pool Index

Usage example: LOAD S41; Load the state of pump1 into register

SNR	Signal
01	Off
02	On
03	Heartbeat
04	Any Failure
05	Any OffSpec
06	Any MaintRequ
07	Any FctCheck
11	Any Zero Failed
12	Any Span Failed
13	Any Range Low
14	Any Range High
15	Any ConcAlarm
21	V1
22	V2
...	...
39	V19

SNR	Signal
40	V20
41	Pump1
42	Pump2
43	Ext Alarm1
44	Ext Alarm2
...	...
49	Ext Alarm7
50	Ext Alarm8
51	PLC Result1
52	PLC Result2
...	...
59	PLC Result9
60	PLC Result10
76	CalcD Rslt HiHi

## Channel Actions Pool Index

Usage example: CALL A103; Start span cal for channel 1, if register changed to TRUE  
 # Replace 'x' in table by channel # (1 ... 5)

ANR	Description
x01	None
x02	ZeroCal
x03	SpanCal
x04	ZeroSpanCal
x05	Cancel
x06	Range1
x07	Range2
x08	Range3
x09	Range4
x10	Failure
x11	OffSpec

ANR	Description
x12	MaintRequ
x13	FctCheck
x14	SampleGas
x15	ZeroGas
x16	SpanGas1
x17	SpanGas2
x18	SpanGas3
x19	SpanGas4
x20	All Closed
x21	Blowback

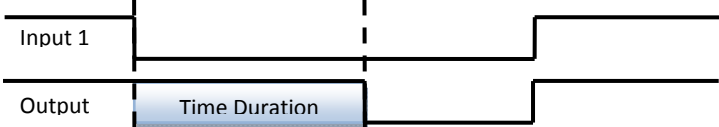
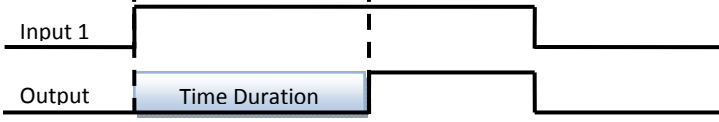

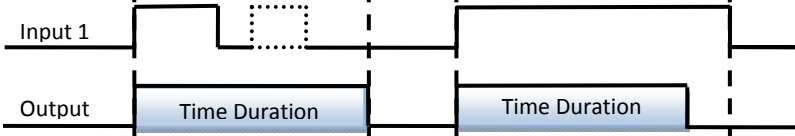
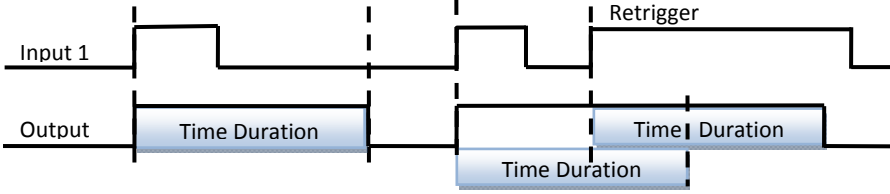
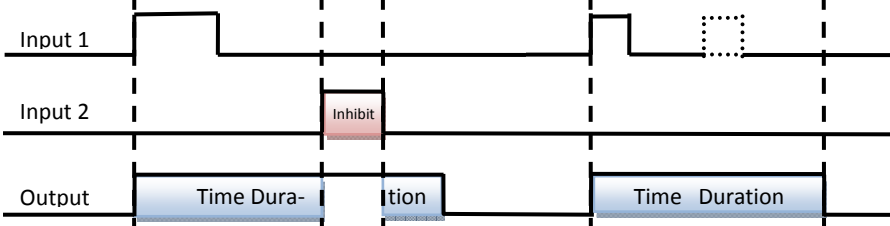
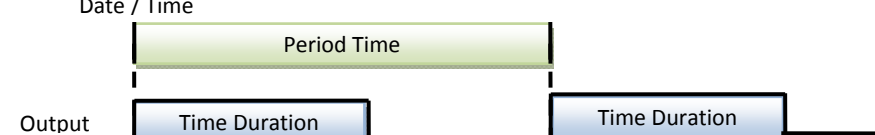
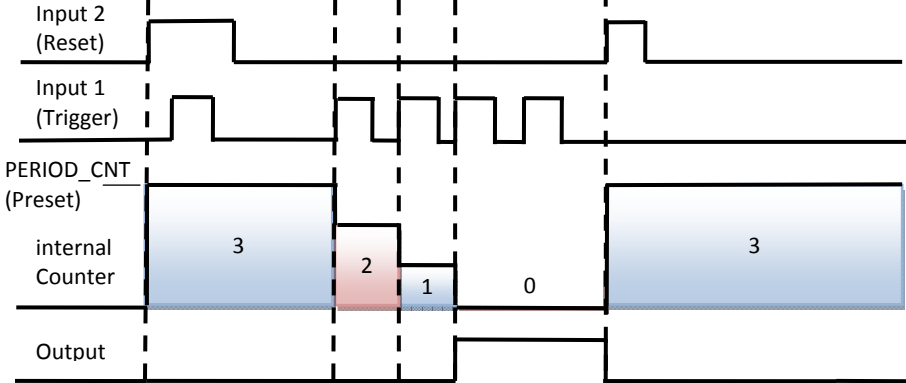
## Channel Digital Output Pool Index

Usage example: LOAD S332; Load press low alarm state of channel 3 into register  
 # Replace 'x' in table by channel # (1 ... 5)

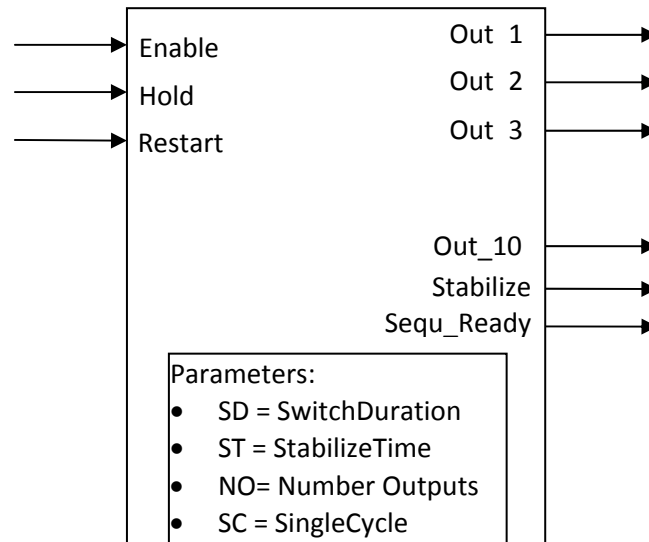
SNr	Description
x01	Off
x02	On
x03	Heartbeat
x04	Failure
x05	OffSpec
x06	MaintRequ
x07	FctCheck
x08	Calibrating
x09	Zeroing
x10	Spanning
x11	Zero Failed
x12	Span Failed
x13	Range Underflow
x14	Range Overflow
x15	Range1
x16	Range2
x17	Range3
x18	Range4
x19	Conc. LoLo
x20	Conc. Lo

SNR	Description
x21	Conc. Hi
x22	Conc. HiHi
x23	Average LoLo
x24	Average Lo
x25	Average Hi
x26	Average HiHi
x27	Temperature LoLo
x28	Temperature Lo
x29	Temperature Hi
x30	Temperature HiHi
x31	Pressure LoLo
x32	Pressure Lo
x33	Pressure Hi
x34	Pressure HiHi
x35	Flow LoLo
x36	Flow Lo
x37	Flow Hi
x38	Flow HiHi
x39	Off
x40	Off

## Timer Modes

TMR_MODE	Timing Diagram	
<b>OFFDELAY</b>		
<b>ONDELAY</b>		
<b>REPPULSE</b>		
<b>SINGLEPULSE</b>		
<b>RETRIGSPULSE</b>		
<b>INHIBSPULSE</b>		
<b>CLKTRGPULSE</b>		
<b>COUNTER</b>		

## Sequencer Function Block



### Example Program 1

```
#### First program line MUST begin with '####'
#-Sequencer #1 is used-----
SEQ_DURATION 1 5;      SD = 5 seconds
SEQ_STAB_TIME 1 2;     ST = 2 seconds
SEQ_NUM_OUTS 1 8;
SEQ_SNGL_CYCLE 1 FALSE;

#-----
#Digital Input#1 is used for enabling the sequencer
LOAD  DI1;           load Digital Input#1
STO   SQ1ENA;        feed Enable input of Sequencer1 with this state

LOAD  SQ101;         load Sequencer1 Out#1
STO   R1;            store as result#1
LOAD  SQ102;         load Sequencer1 Out#2
STO   R2;            store as result#2
LOAD  SQ103;         load Sequencer1 Out#3
STO   R3;            store as result#3
LOAD  SQ104;         load Sequencer1 Out#4
STO   R4;            store as result#4
LOAD  SQ105;         load Sequencer1 Out#5
STO   R5;            store as result#5
LOAD  SQ106;         load Sequencer1 Out#6
STO   R6;            store as result#6
LOAD  SQ107;         load Sequencer1 Out#7
STO   R7;            store as result#7
LOAD  SQ108;         load Sequencer1 Out#8
STO   R8;            store as result#8

LOAD  SQ1STAB;       load Sequencer1 Stabilize
STO   R9;            store as result#9

END;                Program end
```

## Example Program 2

```
#### First program line MUST begin with '####'
#-Example for Timer 1-----
TMR_MODE      1 OFFDELAY;
TMR_DURATION   1 5; delay 5 sec

#-Example for Timer 2-----
TMR_MODE      2 ONDELAY;
TMR_DURATION   2 5; delay 5 sec

#-Example for Timer 3-----
TMR_MODE      3 REPPULSE;
TMR_DURATION   3 5; pulse width 5 sec
TMR_PERIOD_CNT 3 20;  periode 20 sec

#-Example for Timer 4-----
TMR_MODE      4 SINGLEPULSE;
TMR_DURATION   4 5; pulse width 5 sec

#-Example for Timer 5-----
TMR_MODE      5 RETRIGSPULSE;
TMR_DURATION   5 5; pulse width 5 sec

#-Example for Timer 6-----
TMR_MODE      6 INHIBSPULSE;
TMR_DURATION   6 10; pulse width 10 sec

#-Example for Timer 7-----
TMR_MODE      7 CLKTRGPULSE;
TMR_DURATION   7 5; pulse width 5 sec
TMR_PERIOD_CNT 7 10; pulse trigger is repeated each 10 minutes
TMR_TRIG_TIME  7 2009,10,26,17,00; start triggering Oct26 2009, 05:00 pm

#-Example for Timer 8-----
TMR_MODE      8 COUNTER;
TMR_PERIOD_CNT 8 10; preset count value = 10

#-----
LOAD  DI1;  Digital Input#1
STO   T1I1,T2I1,T3I1; feed Input1 of Timers1..3 with this state
STO   R9;   assign Digital Input#1 also to Result#9
LOAD  DI5;  load Digital Input#2
STO   T1I2,T2I2,T3I2; feed Input2 of Timers1..3 with this state
#-----
LOAD  T1;   read Timer 1 output
STO   R1;   store as Result#1
#-----
LOAD  DI5;  read Digital Input #5
IF    R10,R2; if DI5 then load Result#10 else load Result#2
CALL  A110; simulate an 'External Failure" of Ch1 if loaded with '1' state
LOAD  T3;   read Timer 3 output
CALL  A311; simulate an "MaintRequ" of Ch3 if loaded with '1' state
#-----
LOAD  S62;  CalcA rslt Lo
STO   R3;   store as Result#3
LOAD  S208; Ch2 calibrating
STO   R4;   store as Result#4

END;          Program end
```

## C Spare Parts List



The following spare parts are mentioned in this manual and may be exchanged without the special knowledge of our authorized service personell.

For a complete spare parts list contact the manufacturer.

### Fuses

Part number	Description
ETC02041	Fuse: liitlefuse fuse 215 series Fuse link T4,00A/250V 5x20 Breaking capacity 1500A@250V
ETC00146	Fuse: liitlefuse fuse 477 series Fuse link T3,15A/400V 5x20 Breaking capacity 1500A@400V DC

### Air Intake Filter

Part number	Description
ETC03181	Replacement filter: Filter ATF60 D-2

### Converter Parts

Part number	Description
655227	(Filled) converter / glass tube: TUBE, CONVERTER - PACKED
632784	Glass tube connectors: CONN,GLASS TUBE

### Shield Connector Terminals

Part number	Description
ETC02019	Ø 1.5...6.5 mm (0.06"...0.25")
ETC02020	Ø 5...11 mm (0.2"...0.43")
ETC02021	Ø 10...17 mm (0.4"...0.66")
ETC02022	Ø 16...24 mm (0.63"...0.94")



## D Safety Data Sheets



*You will find safety data sheets of the following substances included in the technical documentation:*

- Converter granulate
- Ozone
- Nitrogen Dioxide
- Nitric Oxide

*Always mind the information given in these data sheets.*

### Converter Granulate

## 1 Identification of substance

Product details:  
Trade name: SIGRADUR<sup>®</sup>K, SIGRADUR<sup>®</sup>G

Manufacturer/Supplier: HTW Hochtemperatur-Werkstoffe GmbH  
Gemeindewald 41  
D-86672 Thierhaupten

Tel.: +49-8271-818611  
Fax: +49-8271-7372  
Email: info@htw-germany.com

Information: see: Chapter 16 (Contact)

Emergency information: see: manufacturer/supplier

## 2 Composition / Data on components

Chemical characterization:  
CAS No. Designation: None

Identification number(s): void

Chemical characterization: Glassy carbon >99.9% C

## 3 Hazards identification

Hazard designation: void

Information pertaining to particular dangers for man and environment: void

## 4 First aid measures

General information: No special measures required.

After inhalation: No special measures required.  
After skin contact: No special measures required.  
After eye contact: No special measures required  
After swallowing: No special measures required.

## 5 Fire fighting measures

Suitable extinguishing agents: All methods of extinguishing are suitable

Special hazards caused by material, its products of combustion or resulting gases: In case of fire carbon dioxide (CO<sub>2</sub>) and under certain conditions carbon monoxide (CO).

Additional Information: No information

## 6 Accidental release measures

Person-related safety precautions: No special measures required  
Measures of environmental protection: No special measures required

**Hochtemperatur-Werkstoffe GmbH • Gemeindewald 41 • D-86672 Thierhaupten**  
**info@htw-germany.com • www.htw-germany.com**

Measures of cleaning/collecting:	Collect mechanically. Dispose of contaminated material as waste according to item 13
----------------------------------	-----------------------------------------------------------------------------------------

## 7 Handling and storage

Information for safe handling:	Ensure good ventilation/exhaustion at the workplace Prevent formation of dust.
Information about protection against explosives and fires:	Refined dust can combine with air to form an explosive mixture.
Requirements to be met by storerooms and containers:	No special measures required
Information about storage in one common storage facility:	No special measures required
Further information about storage conditions:	No information

## 8 Exposure controls and personal protection

Additional information about design of technical systems:	No further data; see item 7
Breathing equipment:	At work with refined dust put on respirator. Not necessary if the room is well-ventilated.
Protection of hands:	At work with splintered material use protective gloves
Protection of eyes:	At work with splintered material put on tightly sealed safety glasses.
Protection of body:	Protective work clothing.

## 9 Physical and chemical properties

Form:	Solid
Colour:	Black
Odour:	Odourless
Change in conditions:	Solid-gaseous over 3300°C
Melting point / melting range:	-
Boiling point / Boiling range:	-
Flash point:	Over 600°C on air start to built CO <sub>2</sub> , under certain conditions CO.
Danger of explosion:	Refined dust causes risk of dust explosion.
Density:	1.45 g/cm <sup>3</sup>
Solubility in /Miscibility with water:	Insoluble

## 10 Stability and reactivity

Thermal decomposition / conditions to be avoided:	-
Dangerous reactions:	Enrichment with refined dust causes risk of dust explosion

Dangerous products of decomposition: CO<sub>2</sub> from 600°C in air  
CO from 1000°C in air

11 Toxicological information

Acute toxicity:	Non-poisonous, biological compatible
Primary irritant effect on the skin:	No irritant effect.
Primary irritant effect on the eye:	No irritant effect.
Other information:	No information
Additional toxicological information:	No information

12 Ecological information

General notes: Absolutely inert

13 Disposal considerations

Recommendation:	Remove according to local authority recommendations.
Uncleaned packaging:	Empty contaminated packaging thoroughly. They can be recycled after thorough and proper cleaning. Dispose of packaging according to regulations

14 Transport information

Land transport ADR/RID (cross-border)	
ADR/RID Class:	-
Substance Index Number:	-
Transport/Additional information:	No dangerous good according to international transport regulations.

15 Regulatory information

Designation according to EC guidelines:	The product is not subject to identification regulations under EC. Directives and Ordinance on Hazardous Materials (GefStoffV). Observe the normal safety regulations when handling chemicals.
-----------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

16 Other information

This data is based on our present knowledge. However, it shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Contact:	Dr. Rainer Dübgen r.duebgen@htw-germany.com
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### Ozone



<b>OZONE</b>	<b>ICSC: 0068</b> <b>April 2009</b>
<b>CAS #: 10028-15-6</b>	
<b>EC Number: 233-069-2</b>	

	<b>ACUTE HAZARDS</b>	<b>PREVENTION</b>	<b>FIRE FIGHTING</b>
<b>FIRE &amp; EXPLOSION</b>	Not combustible but enhances combustion of other substances. Many reactions may cause fire or explosion. Risk of fire and explosion on contact with combustible substances.	NO open flames, NO sparks and NO smoking. NO contact with combustible substances. Closed system, ventilation, explosion-proof electrical equipment and lighting.	In case of fire in the surroundings, use appropriate extinguishing media. Combat fire from a sheltered position.

<b>STRICT HYGIENE!</b>			
	<b>SYMPTOMS</b>	<b>PREVENTION</b>	<b>FIRST AID</b>
<b>Inhalation</b>	Sore throat. Cough. Headache. Shortness of breath. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
<b>Skin</b>	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
<b>Eyes</b>	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
<b>Ingestion</b>			

<b>SPILLAGE DISPOSAL</b>	<b>CLASSIFICATION &amp; LABELLING</b>
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation.	<p><b>According to UN GHS Criteria</b></p> <div style="text-align: center;"> </div> <p><b>DANGER</b></p> <p>May cause or intensify fire; oxidizer            Fatal if inhaled            Causes eye irritation            Causes damage to lungs if inhaled            Causes damage to the lungs through prolonged or repeated exposure if inhaled</p> <p><b>Transportation UN Classification</b></p>
<b>STORAGE</b>	
Fireproof if in building. Separated from all substances. Cool.	
<b>PACKAGING</b>	

International Labour Organization World Health Organization	Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2017	European Commission
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OZONE		ICSC: 0068
PHYSICAL & CHEMICAL INFORMATION		
<p><b>Physical State; Appearance</b> COLOURLESS OR BLUISH GAS WITH CHARACTERISTIC ODOUR.</p> <p><b>Physical dangers</b> The gas is heavier than air.</p> <p><b>Chemical dangers</b> Decomposes on warming. This produces oxygen. This generates fire and explosion hazard. Reacts violently with inorganic and organic compounds. This generates fire and explosion hazard. Attacks rubber.</p>	<p>Formula: O<sub>3</sub> Molecular mass: 48.0 Boiling point: -112°C Melting point: -193°C Solubility in water: none Relative vapour density (air = 1): 1.6</p>	

EXPOSURE & HEALTH EFFECTS	
<b>Routes of exposure</b> The substance can be absorbed into the body by inhalation.	<b>Inhalation risk</b> A harmful concentration of this gas in the air will be reached very quickly on loss of containment.
<b>Effects of short-term exposure</b> The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. This may result in impaired vigilance and performance. Inhalation of the gas may cause lung oedema. See Notes. The effects may be delayed. The liquid may cause frostbite.	<b>Effects of long-term or repeated exposure</b> Repeated or prolonged inhalation of the gas may cause effects on the lungs.

OCCUPATIONAL EXPOSURE LIMITS
TLV: (light work): 0.1 ppm as TWA. TLV: (moderate work): 0.08 ppm as TWA. TLV: (heavy work): 0.05 ppm as TWA. (less than 2 hours work): 0.2 ppm as TWA; A4 (not classifiable as a human carcinogen). MAK: carcinogen category: 3B

ENVIRONMENT
This substance may be hazardous to the environment. Special attention should be given to plants.

NOTES
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered. The TLV for heavy, moderate or light workloads ≤ 2 hours is 0.20ppm as TWA.

ADDITIONAL INFORMATION
<b>EC Classification</b>

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See Also:  
[Toxicological Abbreviations](#)

**Nitrogen Dioxide**

<b>NITROGEN DIOXIDE</b>		<b>ICSC: 0930</b>
Dinitrogen tetroxide (see notes) Nitrogen tetroxide Nitrogen peroxide		<b>October 2013</b>
<b>CAS #: 10102-44-0</b>		
<b>UN #: 1067</b>		
<b>EC Number: 233-272-6</b>		

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
<b>FIRE &amp; EXPLOSION</b>	Not combustible but enhances combustion of other substances.	NO contact with combustible substances.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
<b>Inhalation</b>	Cough. Sore throat. Shortness of breath. Dizziness. Headache. Burning sensation. Laboured breathing. Nausea. Symptoms may be delayed. See Notes.	Use breathing protection, closed system or ventilation.	Fresh air, rest. Half-upright position. Administration of oxygen may be needed. Refer immediately for medical attention.
<b>Skin</b>	Redness. Burning sensation. Pain. Serious skin burns.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer immediately for medical attention.
<b>Eyes</b>	Redness. Pain. Severe burns.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
<b>Ingestion</b>	Burns in mouth and throat.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. Ventilation. Do NOT absorb in saw-dust or other combustible absorbents. Remove vapour with fine water spray. Neutralize used water with chalk or soda.	<p><b>According to UN GHS Criteria</b></p>  <p><b>DANGER</b></p> <p>Contains gas under pressure; may explode if heated May cause or intensify fire; oxidizer Fatal if inhaled Causes severe skin burns and eye damage Causes damage to lungs Causes damage to the lungs through prolonged or repeated exposure</p> <p><b>Transportation</b> <b>UN Classification</b> UN Hazard Class: 2.3; UN Subsidiary Risks: 5.1 and 8</p>
STORAGE	
Ventilation along the floor. Separated from combustible substances and reducing agents.	
PACKAGING	

NITROGEN DIOXIDE		ICSC: 0930
PHYSICAL & CHEMICAL INFORMATION		
<b>Physical State; Appearance</b> REDDISH-BROWN GAS OR BROWN OR YELLOW LIQUID WITH PUNGENT ODOUR.		Formula: NO <sub>2</sub> Molecular mass: 46.0 Boiling point: 21.2°C Melting point: -11.2°C Relative density (water = 1): 1.45 (liquid) Solubility in water: reaction Vapour pressure, kPa at 20°C: 96 Relative vapour density (air = 1): 1.58
<b>Physical dangers</b> The gas is heavier than air.		
<b>Chemical dangers</b> The substance is a strong oxidant. It reacts violently with combustible and reducing materials. Reacts with water. This produces nitric acid and nitric oxide. Attacks many metals in the presence of water.		

EXPOSURE & HEALTH EFFECTS	
<b>Routes of exposure</b> The substance can be absorbed into the body by inhalation.	<b>Inhalation risk</b> A harmful concentration of this gas in the air will be reached very quickly on loss of containment.
<b>Effects of short-term exposure</b> The substance is corrosive to the eyes, skin and respiratory tract. Exposure at high concentrations could cause asphyxiation due to swelling in the throat. Inhalation of the gas or vapour may cause lung oedema. See Notes. Exposure far above the OEL could cause death. The effects may be delayed. Severe effects may occur following a prolonged symptom-free period. Medical observation is indicated.	<b>Effects of long-term or repeated exposure</b> The substance may have effects on the lungs. This may result in impaired functions and decreased resistance to infection.

OCCUPATIONAL EXPOSURE LIMITS
TLV: 0.2 ppm as TWA; A4 (not classifiable as a human carcinogen). MAK: 0.95 mg/m <sup>3</sup> , 0.5 ppm; peak limitation category: I(1); carcinogen category: 3B; pregnancy risk group: D. EU-OEL: 0.96 mg/m <sup>3</sup> , 0.5 ppm as TWA; 1.91 mg/m <sup>3</sup> , 1 ppm as STEL

ENVIRONMENT

NOTES
The commercial brown liquid under pressure is an equilibrium mixture of nitrogen dioxide and the colourless nitrogen tetroxide (CAS 10544-72-6). Non irritant concentration may cause lung oedema. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered. Rinse contaminated clothing with plenty of water because of fire hazard. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION
<b>EC Classification</b> Symbol: O, T+; R: 8-26-34; S: (1/2)-9-26-28-36/37/39-45; Note: 5

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### Nitric Oxide






<b>NITRIC OXIDE</b> Nitrogen oxide Mononitrogen monoxide	<b>ICSC: 1311</b> <b>June 2015</b>
<b>CAS #: 10102-43-9</b> <b>UN #: 1660</b> <b>EC Number: 233-271-0</b>	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
<b>FIRE &amp; EXPLOSION</b>	Not combustible but enhances combustion of other substances.	NO contact with combustible substances.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
<b>Inhalation</b>	Cough. Shortness of breath.	Use ventilation.	Fresh air, rest.
<b>Skin</b>			
<b>Eyes</b>	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
<b>Ingestion</b>			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. Shut off cylinder if possible. Isolate the area until the gas has dispersed.	<p><b>According to UN GHS Criteria</b></p>  <p><b>DANGER</b></p> <p>Contains gas under pressure; may explode if heated May cause or intensify fire; oxidizer Toxic if inhaled Causes damage to lungs Causes damage to the lungs through prolonged or repeated exposure</p> <p><b>Transportation</b> <b>UN Classification</b> UN Hazard Class: 2.3; UN Subsidiary Risks: 5.1 and 8</p>
<b>STORAGE</b>	
Fireproof if in building. Keep in a well-ventilated room.	
<b>PACKAGING</b>	

  <p>Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2017</p>	
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NITRIC OXIDE		ICSC: 1311
PHYSICAL & CHEMICAL INFORMATION		
<b>Physical State; Appearance</b> COLOURLESS COMPRESSED GAS.	<b>Formula:</b> NO <b>Molecular mass:</b> 30.0 <b>Boiling point:</b> -151.8°C <b>Melting point:</b> -163.6°C <b>Solubility in water, ml/100ml at 0°C:</b> 7.4 <b>Relative vapour density (air = 1):</b> 1.04	
<b>Physical dangers</b>		
<b>Chemical dangers</b> The substance is a strong oxidant. It reacts with combustible and reducing materials.		
EXPOSURE & HEALTH EFFECTS		
<b>Routes of exposure</b> The substance can be absorbed into the body by inhalation.	<b>Inhalation risk</b> A harmful concentration of this gas in the air will be reached very quickly on loss of containment.	
<b>Effects of short-term exposure</b> Inhalation of high concentrations of the gas may cause damage to the lungs.	<b>Effects of long-term or repeated exposure</b> Repeated or prolonged inhalation may cause effects on the lungs.	
OCCUPATIONAL EXPOSURE LIMITS		
TLV: 25 ppm as TWA; BEI issued. MAK: 0.63 mg/m <sup>3</sup> , 0.5 ppm; peak limitation category: I(2); pregnancy risk group: D. EU-OEL: 2.5 mg/m <sup>3</sup> , 2 ppm as TWA		
ENVIRONMENT		
NOTES		
There is no odour warning even when toxic concentrations are present. Contact with air generates nitrogen dioxide. See ICSC 0930.		
ADDITIONAL INFORMATION		
<b>EC Classification</b>		
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See Also:

[Toxicological Abbreviations](#)

## **E Troubleshooting**

### E.1 XE-related Troubleshooting

The following section contains only XE-related troubleshooting.

A display message will be shown with the most probable according cause and the recommended action to take.

12/2019

Message [Status level]	Explanation	Recommended Actions
Calculator program error [Maintenance]	While running the calculator, an inconsistency was detected	<ul style="list-style-type: none"> <li>Check the calculator program for syntax errors, impossible commands or signal references</li> </ul>
Calculator program error [Maintenance]	Division by 0 detected	<ul style="list-style-type: none"> <li>Check for divisions by 0</li> </ul>
Can't open data logger file [Maintenance]	Accessing the data logger file is not possible	<ul style="list-style-type: none"> <li>Check if internal disk is present/installed</li> <li>Call Emerson Service</li> </ul>
Can't write to data logger file [Maintenance]	Accessing the data logger file is not possible	<ul style="list-style-type: none"> <li>Check if internal disk is present/installed</li> <li>Call Emerson Service</li> </ul>
Cfg checksum error [Maintenance]	Creating a binary backup configuration file caused a checksum error.	<ul style="list-style-type: none"> <li>Repeat the last storing procedure</li> <li>Check if internal disk is present/installed</li> <li>Call Emerson service</li> </ul>
Cfg file open error [Maintenance]	Opening the binary backup configuration file is not possible.	<ul style="list-style-type: none"> <li>Repeat the last storing procedure</li> <li>Check the file system for consistency using CHKDISK tool</li> </ul>
Cfg file read error [Maintenance]	Reading the binary backup configuration file is not possible	<ul style="list-style-type: none"> <li>Check if internal disk is present/installed</li> <li>Call Emerson service</li> </ul>
Cfg file write error [Maintenance]	Writing the binary backup configuration file is not possible.	<ul style="list-style-type: none"> <li>Check if internal disk is present/installed</li> <li>Call Emerson service</li> </ul>
Checksum error [Maintenance]	Creating the factory configuration file caused a checksum error.	Store a new factory configuration file.
Config checksum error [Maintenance]	Creating the user configuration file caused a checksum error.	Create a new user configuration file.
Config file open error [Maintenance]	Opening the user configuration file is not possible.	Call Emerson service
Config file read error [Maintenance]	Reading to the user configuration file is not possible.	Call Emerson service
Config file write error [Maintenance]	Writing to the user configuration file is not possible	Call Emerson service
Data logger format changed [Maintenance]	The output format for the data logger has been changed by the user. The ongoing data logging is not according this new format yet.	Disable data logger and reenale again.

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Message [Status level]	Explanation	Recommended Actions
Device not in service [Function Check]	Operator has set the analyzer to function check mode	Set analyzer into service
DISK free space warning [Maintenance]	Internal disk usage exceeded specified limit (default: 80 %)	Free space by deleting files
DISK full [Maintenance]	Internal disk usage exceeded 95 % limit	Free space by deleting files
DISK protected [Maintenance]	The SD card is write protected.	Check SD card's LOCK-switch to be not set to 'lock' state.
DISK uninstalled/missing [Maintenance]	The SD card is not properly installed.	Check SD card and proper connection.
DLOG: File Limit Reached [Maintenance]	The maximum amount of data logger files is achieved.	Save existing data logger files onto a PC and then delete the data logger files stored in device.
DLOG: File Limit Warn [Maintenance]	The maximum amount of data logger files is achieved soon.	Save existing data logger files onto a PC and then delete the data logger files stored in device.
E-Mail: Not sent [Maintenance]	Failed to send e-mail	<ul style="list-style-type: none"> <li>• Check Ethernet connection</li> <li>• Check SMTP configuration</li> </ul>
External Failure [Failure]	An external source (e.g. digital input or PLC program) meets a failure condition that is forwarded to the self-diagnostics system.	<ul style="list-style-type: none"> <li>• Check the assigned digital input for the condition.</li> <li>• Check PLC program for the condition.</li> <li>• Reassign digital inputs to not being forwarded to the diagnostic system.</li> </ul>
External FctCheck [Function Check]	An external source (e.g. digital input or PLC program) meets a function check condition that is forwarded to the self-diagnostics system.	<ul style="list-style-type: none"> <li>• Check the assigned digital input for the condition.</li> <li>• Check PLC program for the condition.</li> <li>• Reassign digital inputs to not being forwarded to the diagnostic system.</li> </ul>
External MaintRequ [Maintenance]	An external source (e.g. digital input or PLC program) meets a maintenance request condition that is forwarded to the self-diagnostics system.	<ul style="list-style-type: none"> <li>• Check the assigned digital input for the condition.</li> <li>• Check PLC program for the condition.</li> <li>• Reassign digital inputs to not being forwarded to the diagnostic system.</li> </ul>

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Message [Status level]	Explanation	Recommended Actions
External OffSpec [Off-spec]	An external source (e.g. digital input or PLC program) meets a out-of-specification condition that is forwarded to the self-diagnostics system.	<ul style="list-style-type: none"> <li>• Check the assigned digital input for the condition.</li> <li>• Check PLC program for the condition.</li> <li>• Reassign digital inputs to not being forwarded to the diagnostic system.</li> </ul>
Factory file open error [Maintenance]	Opening the factory configuration file is not possible.	<ul style="list-style-type: none"> <li>• Create a new factory configuration file</li> <li>• Check the file system for consistency using CHKDISK tool</li> </ul>
Factory file read error [Maintenance]	Reading the factory configuration file is not possible	<ul style="list-style-type: none"> <li>• Check if internal disk is present/installed</li> <li>• Call Emerson service</li> </ul>
Factory file write error [Maintenance]	Writing the factory configuration file is not possible. This message does not appear during normal operation only on factory investigations!	<ul style="list-style-type: none"> <li>• Check if internal disk is present/installed</li> <li>• Call Emerson service</li> </ul>
FATAL!! Configuration data destroyed [Failure]	The instrument is now unconfigured, because retrieving the configuration data from several sources failed.	<ul style="list-style-type: none"> <li>• Check if internal disk is present/installed</li> <li>• Call Emerson service</li> </ul>
FATAL: FRAM read/write error [Maintenance]	The instrument is now unconfigured, because retrieving the configuration data from several sources failed.	Call Emerson service
FLASH write count over limit [Maintenance]	Write cycles to internal CPU Flash Memory exceeded number of 90,000.	Call Emerson service
Input Simulation On XDIO 1 [Function Check]	The digital inputs of board DIO 1 are simulated for service purposes.	<ul style="list-style-type: none"> <li>• Restart device.</li> <li>• Ask service personnel to deactivate simulation.</li> </ul>
Input Simulation On XDIO 2 [Function Check]	The digital inputs of board DIO 2 are simulated for service purposes.	<ul style="list-style-type: none"> <li>• Restart device.</li> <li>• Ask service personnel to deactivate simulation.</li> </ul>
Limitation Analog Output1 [Off-spec]	Concentration assigned to the indicated analog output is outside configured ranges: Analog output is limited to configured ranges	<ul style="list-style-type: none"> <li>• Use another measurement range.</li> <li>• Extend analog output range configuration if possible.</li> <li>• Run measurement inside its given ranges.</li> </ul>



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Message [Status level]	Explanation	Recommended Actions
Limitation Analog Output2 [Off-spec]	Concentration assigned to the indicated analog output is outside configured ranges: Analog output is limited to configured ranges	<ul style="list-style-type: none"> <li>• Use another measurement range.</li> <li>• Extend analog output range configuration if possible.</li> <li>• Run measurement inside its given ranges.</li> </ul>
Limitation Analog Output3 [Off-spec]	Concentration assigned to the indicated analog output is outside configured ranges: Analog output is limited to configured ranges	<ul style="list-style-type: none"> <li>• Use another measurement range.</li> <li>• Extend analog output range configuration if possible.</li> <li>• Run measurement inside its given ranges.</li> </ul>
Limitation Analog Output4 [Off-spec]	Concentration assigned to the indicated analog output is outside configured ranges: Analog output is limited to configured ranges	<ul style="list-style-type: none"> <li>• Use another measurement range.</li> <li>• Extend analog output range configuration if possible.</li> <li>• Run measurement inside its given ranges.</li> </ul>
Limitation Analog Output5 [Off-spec]	Concentration assigned to the indicated analog output is outside configured ranges: Analog output is limited to configured ranges	<ul style="list-style-type: none"> <li>• Use another measurement range.</li> <li>• Extend analog output range configuration if possible.</li> <li>• Run measurement inside its given ranges.</li> </ul>
Operation hours exceeded [Maintenance]	The operation hours exceeded the service interval time.	<ul style="list-style-type: none"> <li>• The instrument, or selected components require maintenance</li> <li>• After maintenance, enter SETUP - OPERATION HOURSMETER, to reset the counter.</li> </ul>
PLC program error [Maintenance]	While installing the PLC program, a program error was discovered.	Check the PLC program for syntax errors, wrong commands or references
SCAL blowback [Function Check]	Device runs system calibration's blowback mode.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL program sequence [Function Check]	Device runs system calibration's program sequence.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>

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Message [Status level]	Explanation	Recommended Actions
SCAL spanning [Function Check]	Currently a system calibration's spanning is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL SpanValid [Function Check]	Currently a system calibration's spanning is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL Zero&SpanValid [Function Check]	Currently a system calibration (zeroing and spanning) is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL zeroing [Function Check]	Currently a system calibration's zeroing is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL zeroing & spanning [Function Check]	Currently a system calibration (zeroing and spanning) is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
SCAL ZeroValid [Function Check]	Currently a system calibration's zeroing is ongoing.	<ul style="list-style-type: none"> <li>• Wait until system calibration procedure is finished</li> <li>• Cancel system calibration procedure</li> </ul>
Sensor command buffer overflow [Failure]	Sensor's XSP-board to CPU communication failure	Call Emerson service, if message shows up repeatedly
Sensor communication timeout [Failure]	The serial communication between the main controller and the sensor interface has timed out. The reason is unknown.	Check both boards, and proper connections.
Sensor CRC check [Failure]	Sensor's XSP-board to CPU communication failure	Call Emerson service, if message shows up repeatedly
Sensor failure [Failure]	Sensor's XSP-board to CPU communication failure	Call Emerson service, if message shows up repeatedly
Sensor invalid message length [Failure]	Sensor's XSP-board to CPU communication failure	Call Emerson service, if message shows up repeatedly
Sensor RESET [Maintenance]	Sensor's XSP-board to CPU communication failure	Call Emerson service, if message shows up repeatedly
USB mass memory full [Maintenance]	The attached USB storage device has not sufficient free memory to store data.	<ul style="list-style-type: none"> <li>• Delete unrequired files from USB storage</li> <li>• Copy contents to a USB storage media with more size and use this one.</li> </ul>

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Message [Status level]	Explanation	Recommended Actions
USB: Free space warning [Maintenance]	The attached USB storage devices's free memory exceeded the setup limit.	<ul style="list-style-type: none"> <li>• Delete unrequired files from USB storage</li> <li>• Copy contents to a USB storage media with more size and use this one.</li> </ul>
Warming up [Function Check]	Some components need to be at a specific temperature to work properly. This message shows, until all components reached their temperatures.	<ul style="list-style-type: none"> <li>• Wait until warmup time has elapsed</li> <li>• Check function of heaters and temperature control</li> </ul>
XASI Missing [Maintenance]	The XASI board is not properly installed.	Check board and proper connection.
XDIO1 missing @4 [Maintenance]	The XDIO 1 board at bus address 4 is not properly installed.	<ul style="list-style-type: none"> <li>• Check board and proper connection.</li> <li>• Check board's proper bus address jumper setting.</li> </ul>
XDIO2 missing @5 [Maintenance]	The XDIO 2 board at bus address 5 is not properly installed.	<ul style="list-style-type: none"> <li>• Check board and proper connection.</li> <li>• Check board's proper bus address jumper setting.</li> </ul>

## E.2 CLD-related Troubleshooting

### Included Document

The following section contains only XE-related troubleshooting.

A display message will be shown with the most probable according cause and the recommended action to take.

<b>CPB MAIN Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
CPBSOM CommFail	CAN communication to XMCO3 sub module fails	Call Emerson service • Check data connection from XMCPB board over XMCPA board to XMCO3.
	CAN communication to XMCPA1 sub module fails	Call Emerson service • Check data connection from XMCPB board to XMCPA1.
	CAN communication to XMCPA2 sub module fails (if installed)	Call Emerson service • Check data connection from XMCPB board to XMCPA1.
	CAN communication to XMCPB_K60 sub module fails	Call Emerson service
	MODBUS communication between SOM and XE Platform fails	Call Emerson service • Check data connection from XMCPB board to XECB.
CPBSOM DB Access failed	Unable to initiaize or update Database	Call Emerson service
	Unable to read or write CAN data to or from Database	Call Emerson service
	Unable to read or write Modbus data to or from Database	Call Emerson service
CPBSOM Envir Alert	CPB-SOM Board Temperature above High Limit	• Check if the environmental conditions of the device match the technical data given in the manual / product data steet. • Check housing filter at the air intake for pollution and, if necessary, replace it.
	CPB-SOM Board Temperature below Low Limit	• Check if the environmental conditions of the device match the technical data given in the manual / product data steet.
	CPB-SOM Environment Temperature above High Limit	• Check if the environmental conditions of the device match the technical data given in the manual / product data steet. • Check housing filter at the air intake for pollution and, if necessary, replace it.

<b>CPB MAIN Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
	CPB-SOM Environment Temperature below Low Limit	<ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> </ul>
CPBSOM Integrity Alert	Any Task is not running	Call Emerson service
	Incompatible HW board revision of sub modules	Call Emerson service
	Incompatible SW versions of sub modules	Call Emerson service <ul style="list-style-type: none"> <li>If you have access rights, check the software versions of the sub modules on the LOI or webbrowser or grant remote access to the device.</li> </ul>
	NOR Flash failure detected	Call Emerson service
	RAM failure detected	Call Emerson service
	SOM DB Set to default values (Coldboot)	Call Emerson service
	SOM Software checksum failure	Call Emerson service
	Unable to generate Config or Status DB	Call Emerson service
CPBSOM Resource Crunch	Unable to generate Shared Memory	Call Emerson service
	LOW RAM	Call Emerson service
CPBSOM FW Upgrade Error	LOW storage (NOR/SD-Card/eMMC)	Call Emerson service
	Firmware Upgrade of XMCO3 sub module failed	Call Emerson service <ul style="list-style-type: none"> <li>Check if the old firmware version supports an upgrade to the new version.</li> </ul>
	Firmware Upgrade of XMCPA1 sub module failed	Call Emerson service <ul style="list-style-type: none"> <li>Check if the old firmware version supports an upgrade to the new version.</li> </ul>
	Firmware Upgrade of XMCPA2 sub module failed (if installed)	Call Emerson service <ul style="list-style-type: none"> <li>Check if the old firmware version supports an upgrade to the new version.</li> </ul>
	Firmware Upgrade of XMCPB_K60 sub module failed	Call Emerson service <ul style="list-style-type: none"> <li>Check if the old firmware version supports an upgrade to the new version.</li> </ul>



<b>CPB CONTROL Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
CPBK60 Envir Alert	Electronics Environment Temperature below Low Limit	<ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> </ul>
	Fan Current above High Limit; fan overload detection	Call Emerson service
	Fan driver failed	Call Emerson service
	K60-MCU Temperature above High Limit	Call Emerson service <ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>Check housing filter at the air intake for pollution and, if necessary, replace it.</li> </ul>
	Plausibility Check for MCU & Electronics Temperature Failed; Plausible if Temp. Difference $\leq X$ °C	Call Emerson service <ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>Check housing filter at the air intake for pollution and, if necessary, replace it.</li> <li>Check Secondary Variables - Electronics Temperature for plausibility.</li> </ul>
Fan Fail	Fan Rotation Speed below Low Limit	<ul style="list-style-type: none"> <li>Check for mechanical blockage of the fan.</li> <li>Check fan connector on XMCPB board.</li> </ul> <p>! This error causes a safety switch-off of heaters and valves. Make sure the problem is solved and acknowledge the alert to bring the device back to normal operation.</p>
	Capillary pressure sensor above its HHH limit; above measurement range	Call Emerson service
	Capillary pressure sensor below its LOLO limit; below measurement range	Call Emerson service

<b>CPB CONTROL Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
CLD Flow Failure	Chamber pressure sensor above its HHH limit; above measurement range	Call Emerson service
	Chamber pressure sensor below its LOLL limit; below measurement range	Call Emerson service
	Ozone Flow EPV-driver Failed	Call Emerson service
	Sample EPV-driver Failed	Call Emerson service
CLD Flow MaintRequ	Ozone Flow EPV-driver Current above High Limit	Call Emerson service
	Ozone Flow PWM Control above High Limit	<ul style="list-style-type: none"> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• Check the O3-EPV connector on the XMCPB board.</li> </ul>
	Ozone Flow PWM Control below Low Limit	<ul style="list-style-type: none"> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> </ul>
	Sample capillary overpressure PWM Control above High Limit	<ul style="list-style-type: none"> <li>• Check sample gas pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• Check the sample EPV connector on the XMCPB board.</li> </ul>
	Sample capillary overpressure PWM Control below Low Limit	<ul style="list-style-type: none"> <li>• Check sample gas pressure to match the values given in the manual or product data sheet.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> </ul>
	Sample EPV-driver Current above High Limit	Call Emerson service

CPB CONTROL Related Messages		
Message	Explanation	Recommended Actions
CLD Flow OffSpec	Ozone Flow above Setpoint High Limit	<ul style="list-style-type: none"> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• If you have access rights, check the valve control PWM in Analyzer Setup - CLD System to be within normal operating range.</li> </ul>
	Ozone Flow below Setpoint Low Limit	<ul style="list-style-type: none"> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• If you have access rights, check the valve control PWM in Analyzer Setup - CLD System to be within normal operating range.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> </ul>
	Sample capillary overpressure above Setpoint High Limit	<ul style="list-style-type: none"> <li>• Check sample gas pressure to match the values given in the manual or product data sheet.</li> <li>• If you have access rights, check the valve control PWM in Analyzer Setup - CLD System to be within normal operating range.</li> </ul>
	Sample capillary overpressure below Setpoint Low Limit	<ul style="list-style-type: none"> <li>• Check sample gas pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• If you have access rights, check the valve control PWM in Analyzer Setup - CLD System to be within normal operating range.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> </ul>

<b>CPB CONTROL Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
	Vent Back Pressure above High Limit	<ul style="list-style-type: none"> <li>• Check exhaust tubing to provide a pressureless flow-off of the gas (e.g. exhaust tubing diameter is at least 1/4 inch).</li> <li>• Check Secondary Variables - Vent Back Pressure for plausibility (in comparison to barometric pressure).</li> <li>• Check barometric pressure to match the values given in the manual or product data sheet.</li> </ul>
	Vent Back Pressure below Low Limit	<ul style="list-style-type: none"> <li>• Check Secondary Variables - Vent Back Pressure for plausibility (in comparison to barometric pressure).</li> <li>• Check barometric pressure to match the values given in the manual or product data sheet.</li> </ul>
CLD Heater Fail	Converter Heater Current above High Limit; heater overload detection	Call Emerson service
	Converter Heater driver Failed	Call Emerson service
	Converter Temperature below LowLow Limit; sensor line short-cut detection	Call Emerson service
	Manifold Heater Current above High Limit; heater overload detection	Call Emerson service
	Manifold Heater driver Failed	Call Emerson service
	Manifold Temperature below LowLow Limit; sensor line short-cut detection	Call Emerson service
	Converter Heater Current below Low Limit; heater line break detection	Call Emerson service

CPB CONTROL Related Messages		
Message	Explanation	Recommended Actions
CLD Heater OffSpec	Converter Temperature above Setpoint High Limit	<ul style="list-style-type: none"> <li>• Check Secondary Variables - Converter Temperature if the converter is already cooling down. Wait until it reaches the setpoint.</li> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> </ul>
	Converter Temperature below Setpoint Low Limit	<ul style="list-style-type: none"> <li>• Check Secondary Variables - Converter Temperature if the converter is still heating up. Wait until it reaches the setpoint.</li> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> <li>• Check the converter power connector on the XMCPB board.</li> </ul>
	Manifold Heater Current below Low Limit; heater line break detection	Call Emerson service
	Manifold Temperature above Setpoint High Limit	<ul style="list-style-type: none"> <li>• Check Secondary Variables - Manifold Temperature if the manifold is already cooling down. Wait until it reaches the setpoint.</li> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> </ul>

CPB CONTROL Related Messages		
Message	Explanation	Recommended Actions
	Manifold Temperature below Setpoint Low Limit	<ul style="list-style-type: none"> <li>• Check Secondary Variables - Manifold Temperature if the manifold is still heating up. Wait until it reaches the setpoint.</li> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> <li>• Check the manifold power connector on the XMCPB board.</li> </ul>
CPBK60 Memory Alert	Cannot initialize the access to the non-volatile memory (Eeprom)	Call Emerson service
	Cannot save data in the dedicated non-volatile memory.	Call Emerson service
	Flash memory image information corrupt	Call Emerson service
NOx Conv Fail	NO/NOx Valve Current above High Limit; valve overload detection	Call Emerson service
	NO/NOx Valve Current below Low Limit on valve activation state; valve line break detection	<ul style="list-style-type: none"> <li>• Check NO/NOx Valve connectors on XMCPB and on the valve.</li> </ul>
	NO/NOx Valve driver Failed	Call Emerson service
	Converter Temperature above High Limit; over temperature & sensor line break detection	<ul style="list-style-type: none"> <li>• Check the converter sensor connector on the XMCPB board.</li> <li>! This error causes a safety switch-off of heaters and valves. Make sure the problem is solved and acknowledge the alert to bring the device back to normal operation.</li> <li>• It is likely, that the mechanical overtemperature switch is triggered which is self-resetting.</li> </ul>

CPB CONTROL Related Messages		
Message	Explanation	Recommended Actions
OverTemp Fail	Electronics Environment Temperature above High Limit	<ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> </ul> <p>! This error causes a safety switch-off of heaters and valves. Make sure the problem is solved and acknowledge the alert to bring the device back to normal operation.</p>
	Manifold Temperature above High Limit; over temperature & sensor line break detection	<ul style="list-style-type: none"> <li>Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>Check the manifold sensor connector on the XMCPB board.</li> </ul> <p>! This error causes a safety switch-off of heaters and valves. Make sure the problem is solved and acknowledge the alert to bring the device back to normal operation.</p> <ul style="list-style-type: none"> <li>It is likely, that the mechanical overtemperature switch is triggered which is self-resetting.</li> </ul>
	12 V Analog Supply below Low Limit	Call Emerson service
	13 V Analog Supply above High Limit	Call Emerson service
	24 V Input Power Switch-Off Notifier Signal	Call Emerson service
	24 V Input Power Voltage above High Limit	Call Emerson service
	24 V Input Power Voltage below Low Limit	Call Emerson service
	3.3 V K60-MCU Analog Supply Voltage above High Limit	Call Emerson service
	3.3 V K60-MCU Analog Supply Voltage below Low Limit	Call Emerson service
	3.3 V K60-MCU Digital Supply Voltage above High Limit	Call Emerson service



<b>CPB CONTROL Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
CPBK60 Supply Fail	3.3 V K60-MCU Digital Supply Voltage below Low Limit	Call Emerson service
	3.3 V Sensors Digital Supply Voltage above High Limit	Call Emerson service
	3.3 V Sensors Digital Supply Voltage below Low Limit	Call Emerson service
	3.3 V SOM Voltage above High Limit	Call Emerson service
	3.3 V SOM Voltage below Low Limit	Call Emerson service
	5 V Analog Voltage above High Limit	Call Emerson service
	5 V Analog Voltage below Low Limit	Call Emerson service
	5 V Digital Voltage above High Limit	Call Emerson service
	5 V Digital Voltage below Low Limit	Call Emerson service
	5 V SOM Voltage above High Limit	Call Emerson service
	5 V SOM Voltage below Low Limit	Call Emerson service
	8 V Bus Voltage above High Limit	Call Emerson service
	8 V Bus Voltage below Low Limit	Call Emerson service
	Power Supply for Peripheral Modules (CPA, CO3) failed	Call Emerson service

CPA Related Messages		
Message	Explanation	Recommended Actions
DetOffProcess Conditions	Photodiode TEC Current above High Limit; TEC overload detection	Call Emerson service
	Photodiode TEC Voltage above High Limit	Call Emerson service
Detector OffSpec	Photodiode TEC Temperature above Setpoint High Limit	<ul style="list-style-type: none"> <li>• Check if the TEC temperature is still approaching the setpoint. Wait until it reaches the setpoint.</li> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>• Check housing filter at the air intake for pollution and, if necessary, replace it.</li> <li>• If you have access rights, check the Detector Control Power in Analyzer Setup - CLD System if it is regulated or at minimum (0 mW).</li> </ul>
	Photodiode TEC Temperature below Setpoint Low Limit	<ul style="list-style-type: none"> <li>• Check if the TEC temperature is still approaching the setpoint. Wait until it reaches the setpoint.</li> <li>• If you have access rights, check the Detector Control Power in Analyzer Setup - CLD System if it is regulated or at maximum (~4500 mW).</li> </ul>
DetEnvir Alert	K60-MCU Temperature above High Limit	Call Emerson service <ul style="list-style-type: none"> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>• Check housing filter at the air intake for pollution and, if necessary, replace it.</li> </ul>
DetMemory Alert	Cannot initialize the access to the non-volatile memory (Eeprom)	Call Emerson service
	Cannot save data in the dedicated non-volatile memory.	Call Emerson service
	Flash memory image information corrupt	Call Emerson service

CPA Related Messages		
Message	Explanation	Recommended Actions
DetSupply Fail	3.3 V Supply Current above High Limit	Call Emerson service
	3.3 V Supply Voltage above High Limit	Call Emerson service
	3.3 V Supply Voltage below Low Limit	Call Emerson service

CO3 Related Messages		
Message	Explanation	Recommended Actions
OzonEnvir Alert	K60-MCU Temperature above High Limit	<p>Call Emerson service</p> <ul style="list-style-type: none"> <li>• Check if the environmental conditions of the device match the technical data given in the manual / product data sheet.</li> <li>• Check housing filter at the air intake for pollution and, if necessary, replace it.</li> </ul>
Ozonator Flow Low	Ozone Flow below Low Limit	<ul style="list-style-type: none"> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• If you have access rights, check the valve control PWM in Analyzer Setup - CLD System to be within normal operating range.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> </ul>
OzonMemory Alert	Cannot initialize the access to the non-volatile memory (Eeprom)	Call Emerson service
	Cannot save data in the dedicated non-volatile memory.	Call Emerson service
	Flash memory image information corrupt	Call Emerson service
	High voltage retrigger protection timeout; Ozone flow too low (see DIAG_O3FLOW_LO); miss CAN communication	<ul style="list-style-type: none"> <li>• Check if ozone flow is present and at its setpoint.</li> <li>• Check air supply pressure to match the values given in the manual or product data sheet.</li> <li>• Check external gas connection for leakage.</li> <li>• Make sure that the analyzer is not in a safety switch-off due to a different failure (indicated by a blinking reading on the LOI).</li> <li>• Check data connection from XMCPB board over XMCPA board to XMCO3.</li> </ul>

<b>CO3 Related Messages</b>		
<b>Message</b>	<b>Explanation</b>	<b>Recommended Actions</b>
Ozonator Fail	Ozonator controlled power above High Limit	Call Emerson service
	Ozonator controlled power below Low Limit	Call Emerson service
	Ozonator disabled	<ul style="list-style-type: none"> <li>• If you have access rights, check the Ozonator Power Control Step in Analyzer Setup - CLD System if it is different from 0.</li> <li>• If you have access rights, set the Ozonator Power Step in Channel Setup - CLD System (Admin) to the right value (Call Emerson service for the correct value).</li> </ul>
	Ozonator high voltage current above High Limit	Call Emerson service
	Ozonator high voltage power below Low Limit	Call Emerson service
	Ozonator high voltage power driver failed	Call Emerson service
	Ozonator power regulator failed	Call Emerson service
Ozonator MaintRequ	Ozonator in standalone mode	<ul style="list-style-type: none"> <li>• Ozonator power control step is set by a hardware potentiometer and cannot be controlled by software.</li> <li>• Call Emerson service to make sure that this is the correct setting for your analyzer. (It is not recommended to use the ozonator in standalone mode in an XECLD.)</li> <li>• To disable the standalone mode set the hardware potentiometer on the ozonator to 0. It can now be controlled by software.</li> </ul>
OzonSupply Fail	24 V Input Power Voltage above High Limit	Call Emerson service
	24 V Input Power Voltage below Low Limit	Call Emerson service
OzonSupply MaintRequ	3.3 V Supply Current above High Limit	Call Emerson service
	3.3 V Supply Voltage above High Limit	Call Emerson service

CO3 Related Messages		
Message	Explanation	Recommended Actions
	3.3 V Supply Voltage below Low Limit	Call Emerson service