Instruction Manual
HASX2E-IM-HS
10/2012

XSTREAM®

Gas Analyzers

X-STREAM X2 Series

Instruction Manual

ROSEMOUNT®
Analytical

www.EmersonProcess.com

EMERSON™
Process Management

ESSENTIAL INSTRUCTIONS
READ THIS PAGE BEFORE PROCEEDING!

Emerson Process Management (Rosemount Analytical) designs, manufactures and tests its products to meet many national and international standards. Because these instruments 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 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 Process Management (Rosemount Analytical) 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 and pressure sources.
- To ensure proper performance, **use qualified personnel** to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people 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**. Look-alike 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**.

The information contained in this document is subject to change without notice.

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SHORT FORM GUIDE FOR THIS MANUAL

To find information about **see chapter**

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The instruments technical data.................................2

Measuring principles characteristics 3

How to install the instruments 4

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checking the instrument´s setup 5

Software menu structure, how to navigate
and menu entries descriptions 6

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Safety Instructions

S

INTRODUCTION

The instruction manual contains information about the component assembly, function, installation, operation and maintenance of the X-STREAM® X2 series gas analyzers.

The manual covers several X-STREAM analyzer models and so many contain information about configurations and/or options not appliccable to your analyzer.

The installation and operation of units for use in explosive environments is not covered in this manual.
Analyzers intended to be used in such environments are supplied with further instruction manuals, which should be consulted in addition to this.

DEFINITIONS

The following definitions explain the use of the terms WARNING, CAUTION and NOTE in this manual.

WARNING

Indicates an operational or maintenance procedure, a process, a condition, an instruction, etc.

Failure to comply may result in injury, death or permanent health risk.

CAUTION

Indicates an operational or maintenance procedure, a process, a condition, an instruction, etc.

Failure to comply may result in damage to or destruction of the instrument, or impaired performance.

NOTE!
Indicates an imperative operational procedure,
or an important condition or instruction.

TERMS USED IN THIS INSTRUCTION MANUAL

Explosive Gas(es)
Flammable Gases and gas mixtures in a mixture with air within the explosive limits.

Flammable Gas(es)
Gases and gas mixtures are assigned to be flammable if they might become ignitable when in a mixture with air.

Infallible Containment
This term is derived from the standards of explosion protection especially from the requirements for pressurized housings: thus an infallible containment can be characterized by no intended leakage into the gas paths enabling gas to enter the inner compartment of the analyzer housing.

Intrinsically Safe Cell (IS Cell)
Cells supplied with an intrinsically safe power signal, approved by a Test Institute, to operate with explosive gases.
The design ensures the IS cells remains safe even in case of failure and explosive gases are not ignited.

Lower Explosion Limit (LEL)
Volume ratio of flammable gas in air below which an explosive gas atmosphere will not be formed: the mixture of gas and air lacks sufficient fuel (gas) to burn.

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).

Protection Class IP66 / NEMA 4X
Both terms are used to specify conditions for equipment to be installed outdoor.

IP stands for Ingress Protection, the first number specifies protection against solid objects (**6. = dust tight**) while the second number specifies the degree of protection against liquids (.**6 = heavy seas**).

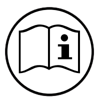
NEMA stands for National Electrical Manufacturers Association. **4X** specifies a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure

Upper Explosion Limit (UEL)
Volume ratio of flammable gas in air above which an explosive gas atmosphere will not be formed: the mixture of gas and air is too rich in fuel (deficient in oxygen) to burn.

SYMBOLS USED ON AND INSIDE THE UNIT

Wherever one or more of the following symbols appear on or inside the instrument, be careful and read the instructions given in the accompanying manuals!

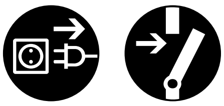
Strictly observe the given warnings, instructions and information to minimize hazards!

This symbol at the instrument ...	... means
	**dangerous voltages** may be accessible. Removing covers is permitted only, if the instrument is disconnected from power - and even in this case by qualified personnel only!
	**hot surfaces** may be accessible. Removing covers by qualified personnel is permitted only, if the instrument is disconnected from power. Nevertheless several surfaces may remain hot for a limited time.
	**more detailled information available:** see instruction manual before proceeding!
	**more detailled information available:** see instruction manual before proceeding!

SYMBOLS USED IN THIS MANUAL

Wherever one or more of the following symbols are used in this instruction manual, read the accompanying information and instructions carefully.

Follow these warnings and notes carefully to minimize risk.

This symbol used in the manual ...	... means
	**dangerous voltages** may be exposed
	**hot surfaces** may be exposed
	possible **danger of explosion**
	**toxic substances** may be present
	**substances harmful to health** may be present
	indicates notes relating to **heavy instruments**
	electrical components may be destroyed by **electrostatic discharges**
	units must be **disconnected from the power source**
	indicates special instructions or information for operation at **low temperatures**.
	indicates basic conditions or procedures are being described. This symbol may also indicate information important for achieving accurate measurements.

SAFETY INSTRUCTIONS

INTENDED USE STATEMENT

X-STREAM series gas analyzers are intended to be used as analyzers for industrial purposes. They must not be used in medical, diagnostic or life support applications nor as safety devices.
Using X-STREAM XE analyzers as safety devices, requiring redundant design or SIL classification, is also not permitted.
No independent agency certifications or approvals are to be implied as covering such applications!

GENERAL SAFETY NOTICE / RESIDUAL RISK

If this equipment is used in a manner not specified in these instructions, protective systems may be impaired.

Despite of incoming goods inspections, production control, routine tests and application of state-of-the-art measuring and test methods, an element of risk remains when operating a gas analyzer!

Even when operated as intended and observing all applicable safety instructions some residual risks remain, including, but not limited to, the following:

- **An interruption of the protective earth line, e.g. in an extension cable, may result in risk to the user.**
- **Live parts are accessible when operating the instrument with doors open or covers removed.**
- **The emission of gases hazardous to health may even be possible when all gas connections have been correctly made.**

Avoid exposure to the dangers of these residual risks by taking particular care when installing, operating, maintaining and servicing the analyzer.

AUTHORIZED PERSONNEL

In-depth specialist knowledge is an absolutely necessary condition for working with and on the analyzer.

Authorized personnel for installing, operating, servicing and maintaining the analyzer are instructed and trained qualified personnel of the operating company and the manufacturer.

It is the responsibility of the operating company to

- **train staff,**
- **observe safety regulations,**
- **follow the instruction manual.**

Operators must

- **have been trained,**
- **have read and understood all relevant sections of the instruction manual before commencing work,**
- **know the safety mechanisms and regulations.**

To avoid personal injury and loss of property, do not install, operate, maintain or service this instrument before reading and understanding this instruction manual and receiving appropriate training.

ADDITIONAL LITERATURE

This manual covers aspects important for installation and startup of X-STREAM X2 gas analyzers.
For comprehensive information on operating and maintain/service the instrument in a safe manner it is MANDATORY to read all additional instruction manuals! If not provided as printed version, check for a accompanying USB stick with an electronic version (PDF)!
The following additional instruction manuals are available or referenced within this manual:

- **HASX2E-SFM-HS X-STREAM X2 short form manual**
- **HASICx-IM-H Infallible containment instruction manual**
- **Separate manuals for Hazardous Area applications**

Contact your local service center or sales office when missing documents.

SAVE ALL INSTRUCTIONS FOR FUTURE USE!

INSTALLING AND CONNECTING THE UNIT

The following notices should be carefollowed to ensure compliance with the **low voltage directive**.

1. Suitable grounding connections should be made at all connectors provided for this purpose.
2. All safety covers and grounding connections must be properly reinstated after maintenance work or troubleshooting.
3. A fuse should be provided at the installation site which will completely disconnect the unit in case of failure. Installing an isolating switch may also be beneficial. In either case, these components must be constructed to conform to recognised norms.

OPERATING AND MAINTAINING THIS UNIT

On leaving our factory, this instrument conformed to all applicable safety directives.
In order to preserve this state of affairs, the operator must take care to follow all the instructions and notes given in this manual and on the unit.

Before switching on the unit, ensure that the local nominal mains voltage corresponds to the factory-set operational voltage of this unit.

Any interruption of the protective earth connections, whether inside or outside of the unit, may result in exposure to the risk of electricity. Deliberately disconnected the protective earth is therefore strictly forbidden.

Removing covers may expose components conducting electric current. Connectors may also be energised. The unit should therefore be disconnected from the power supply before any kind of maintenance, repair or calibration work requiring access to the inside of the unit.

Only trained personnel who are aware of the risk involved may work on an open and energized unit.

Fuses may only be replaced by fuses of an identical type and with identical ratings. It is forbidden to use repair fuses or to bypass fuses.
Take note of all applicable regulations when using this unit with an autotransformer or a variable transformer.

Substances hazardous to health may escape from the unit’s gas outlet. This may require additional steps to be taken to guarantee the safety of operating staff.

Safety Instructions

WARNING

EXPLOSION HAZARD

The units described in this manual may not be used in explosive atmospheres without additional safety measures.

WARNING

ELECTRICAL SHOCK HAZARD

Do not operate without covers secure. Do not open while energized. Installation requires access to live parts which can cause death or serious injury.

For safety and proper performace this instrument must be connected to a properly grounded three-wire source of power.

WARNING

TOXIC GASES

This unit's exhaust may contain toxic gases such as (but not limited to) e.g. sulfur dioxide. These gases can cause serious injuries.
Avoid inhaling exhaust gases.

Connect the exhaust pipe to a suitable flue and inspect the pipes regularly for leaks.

All connections must be airtight to avoid leaks. See section 7.2, page 7-2 for instructions on performing a leak test.

CAUTION

HEAVY INSTRUMENT

The models intended for outside and wall mounted use (X-STREAM XLF, XXF and X2FD) weigh between 26 kg (57 lb) and 63 kg (139 lb), depending on version and options installed.

Two people and/or lifting equipment is required to lift and carry these units.

Take care to use anchors and bolts specified to be used for the weight of the units!

Take care the wall or stand the unit is intended to be installed at is solid and stable to support the weight!

CAUTION

HIGH TEMPERATURES

Hot parts may be exposed when working on photometers and/or heated components in the unit.

GASES AND PREPARATION OF GASES

WARNING

GASES HAZARDOUS TO HEALTH

Follow the safety precautions for all gases (sample and span gases) and gas cylinders.

Before opening the gas lines, they must be purged with air or neutral gas (N_2) to avoid danger from escaping toxic, flammable, exposive or hazardous gases.

WARNING

EXPLOSIVE GASES

When supplying flammable gases with concentrations of more than ¼ of the lower explosion limit, we RECOMMEND implementing one or more additional safety measures:

- **purging the unit with inert gas**
- **stainless steel internal pipes**
- **flame arrestors on gas inlets and outlets**
- **inherently safe or failsafe measuring cells**

CAUTION

OPERATION AT LOW TEMPERATURES

When operating an instrument at temperatures below 0 °C (32 °F), do NOT apply gas nor operate the internal pump before the warmup time has elapsed!

Violation may result in condensation inside the gas paths or damaged pump diaphragm!

Power supply

CAUTION

Ensure that the local power voltage where the unit is to be installed, corresponds to the unit's nominal voltage as given on the name plate label.

WARNING

CONNECTING UNITS FOR PERMANENT INSTALLATION

Only qualified personnel following all applicable and legal regulations may install the unit and connect it to power and signal cables. Failure to comply may invalidate the unit's warranty and cause exposure to the risk of damage, injury or death.

This unit may only be installed by qualified personnel familiar with the possible risks.

Working on units equipped with screw-type terminals for electrical connections may require the exposure of energized components.

Wall-mounted units have no power switch and are operational when connected to a power supply. The operating company is therefore required to have a power switch or circuit breaker (as per IEC 60947-1/-3) available on the premises. This must be installed near the unit, easily accessible to operators and labelled as a power cut-off for the analyzer.

CAUTION

ADDITIONAL NOTES FOR UNITS WITH SCREW-TYPE TERMINALS

Cables for external data processing must be double-insulated against mains power.

If this is not possible, cables must be laid in such a way as to guarantee a clearance of at least 5 mm from power cables. This clearance must be permanently secured (e.g. with cable ties)

General operating notes

WARNING

EXPLOSION HAZARD

Exhaust gases may contain hydrocarbons and other toxic gases such as carbon monoxide. Carbon monoxide is toxic.

Faulty gas connections may lead to explosion and death.

Ensure that all gas connections are connected as labelled and airtight.

- The unit must be installed in a clean and dry area protected from strong vibrations and frost.
- The unit must not be exposed to direct sunlight and sources of heat. Admissable ambient temperatures (see technical details) must be adhered to.
- Gas inlets and outlets must not be interchanged.All gases must be supplied to the unit already processed. When using this unit with corrosive sample gases, ensure that these gases do not contain components harmful to the gas lines.
- Admissable gas pressure for sample and test gases is 1500 hPa.
- Exhaust lines must be laid inclined downwards, depressurized, protected from frost and according to applicable regulations.
- If it is necessary to disconnect the gas lines, the unit’s gas connectors must be sealed with PVC caps to avoid polluting the internal gas lines with condensate, dust, etc.
- To ensure electromagnetic compatibility (EMC), only shielded cables (supplied by us on request, or of equivalent standard) may be used. The customer must ensure that the shielding is correctly fitted (☞ section 4.5, page 4-31). Shielding and terminal housing must be electrically connected; submin-D plugs and sockets must be screwed to the unit.
- When using optional external adapters (submin-D to screw-type terminal), protection from electromagnetic interference can no longer be guaranteed (CE compliance pursuant to EMC guidelines). In this case the customer or operating company functions as a maker of a system and must therefore ensure and declare compliance with EMC guidelines.

Chapter 1
Technical description

The following are the main features of the new Emerson Process Management X-STREAM gas analyzers in brief:

- compact design with easily accessible internal components
- customizable for a wide range of applications: different housings are available while internal construction remains largely identical
- multilingual microprocessor-controlled user interface with liquid crystal (LCD) or vacuum flourescent display (VFD) to indicate measurement value and status messages
- units for outdoor use are optionally supplied with an impact tested front panel
- widerange power supply unit for worldwide use without modification (½ 19in units with internal or external PSUs)

X-STREAM X2 gas analyzers can measure up to four different gas components by multiple combinations of the following analyzing techniques (restrictions apply to ½19in units):

IR = non-dispersive infrared analysis

UV = ultraviolet analysis

pO_2 = paramagnetic oxygen analysis

eO_2 = electrochemical oxygen analysis

tO2 = electrochemical trace oxygen analysis

TC = thermal conductivity analysis

tH_2O = trace moisture measurement

Modified resistant measuring cells are available for use with corrosive gases and/or gases containing solvents.

Special configurations (e.g. intrinsically safe or infallible measuring cells) for the analysis of combustible gases are also available.

☞ Chapter 3 contains a detailed description of the various measuring techniques.

Standard applications

The use of different housings allow X-STREAM analyzers to be tailored to the many different applications:

- Tabletop units in ½19in modular design, with IP 20 protection class
- Tabletop and rackmountable units in 19 in modular design, with IP 20 protection class
- Stainless steel wallmountable field housing with IP 66 / NEMA 4X protection class for outdoor use (operating temperature -20°C to +50°C).
- Cast aluminium wallmountable field housing with IP 66 / NEMA 4X protection class for outdoor use (operating temperature -20°C to +50°C).

The various analyzer types are described in more detail in ☞ section 1.4, page 1-12ff.

Installation in hazardous areas

X-STREAM analyzers in field housings, when fitted with various protective devices, can also be installed and operated in hazardous environments. Available options are:

- Non-incendive assembly (Ex nA nC) for installation in Zone 2 and Division 2 for the measurement of non-flammable gases.
- Pressurized enclosure conforming to ATEX directive 94/9/EC, for installation in zone 2.

- Simplified purge system (Z-purge) for installation in North American Div 2 environments.

The cast aluminium field housing (Ex d) is designed to withstand an explosion and intended to be used in hazardous areas of Zone 1. Its robust design with NEMA 4X / IP 66 protection also enables the installation in rough environments outside hazardous areas.

More information about analyzers for hazardous areas can be obtained from your Emerson Process Management sales office.

Note!

These instructions do not detail the installation or operation of X-STREAM analyzers in hazardous areas. ***If you intend to use your analyzer for such purposes, we would draw your attention to the separate instruction manuals supplied with analyzers for use in hazardous areas.***

Further features (in parts options):

- Configurable measurement display
  - gas values and/or secondary measurements (e. g. flow)
  - single or dual pages
- Configurable measurement units
  - supports conversion factors from ppm to several other, even user specific units
- 3 independent software access levels
  - protection against unauthorized changing of configurations
  - password protected
  - to be separately activated
- Unattended zero and span calibrations
  - calibrations without user interaction
- Backup and restore analyzer configurations to/from protected internal memory.

1.1 Overview

All X-STREAM gas analyzers feature an easy-to-use alphanumeric 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 five languages for the display (currently available: English, French, German, Italian and Spanish).

1.1.1 The Front Panel

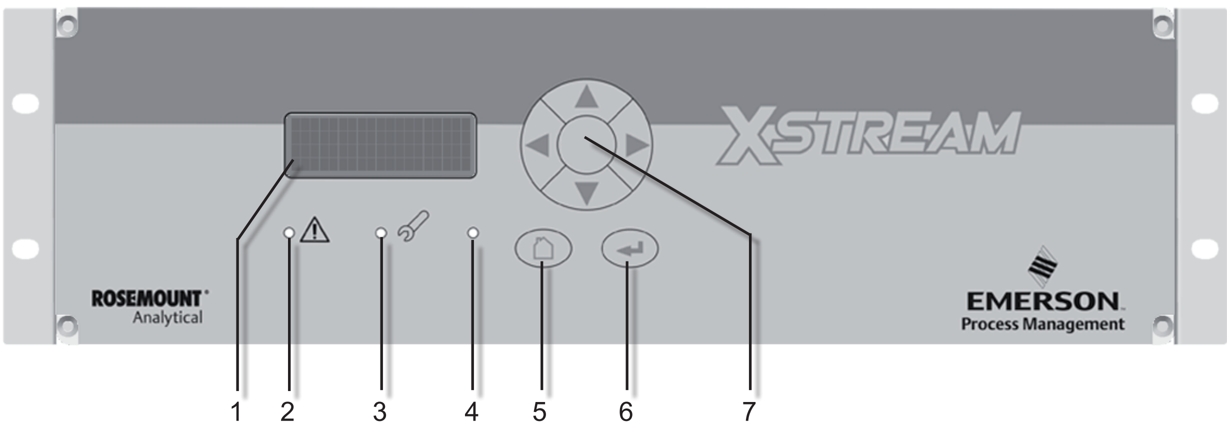
All X-STREAM gas analyzers feature an alphanumeric LCD display with 4x20 characters, showing measurement and status information.

Wall-mounted units can, as an alternative, be fitted with a vacuum fluorescent display, increasing legibility in brighter environments. The display can also be protected with an impact tested glass panel.

All analyzer types also feature three LEDs on the front panel which display status information in addition to the plain text messages.

The colors of the LEDs are based on the NAMUR NE 44 specifications. The LEDs are activated in accordance with the NE 107 standards, and indicate “Failure”, “Function check”, “Out of specification” and “Maintenance request”. For further information, see ☞ chapter 8, page 8-1.

The analyzer software is operated by means of only six keys.



1 4x20 character alphanumeric display
2 LED (red)
3 LED (red)
4 LED (green)
5 “Measure“ key
6 “Enter” key
7 4 keys for settings and menu navigation

Fig. 1-1: X-STREAM Front Panel (here the X-STREAM X2GP)

1.2 Configuration of Gas Lines

Various materials are available to allow the analyzer to be customized to your needs. The materials used are selected based on the characteristics of the sample gas, e.g. diffusion rate, corrosiveness, temperature and pressure.

1.2.1 Materials Used

The physical and chemical properties of the sample gas as well as the conditions under which measurement takes place influence the choice of materials. Among those available are Viton®, PFA and stainless steel.

1.2.2 Safety Filter

The analyzers are generally fitted with an internal stainless-steel filter. This filter is not a replacement for any dust filter in the preparation of the gas, but represents a last line of defence.

1.2.3 Inlets and Outlets

Rackmounted and tabletop devices are fitted with PVDF inlets and outlets (ø 6/4 mm) as standard. Alternatively, Swagelok™ or stainless steel fittings (ø 6/4 mm or ¼ in can be fitted.

Wall-mounted field housings are supplied with Swagelok™ or stainless steel fittings (ø 6/4 mm or ¼ in) ausgestattet.

Other materials available on request.

X-STREAM X2FD units are always supplied with flame arrestors and stainless steel fittings (ø 6/4 mm or ¼ in).

1.2.4 Pipework

Unless otherwise specified, the analyzers are supplied with Viton® or PVDF piping (ø 6/4 mm or ¼ in). Other materials (e.g. stainless steel) can be used, depending on the application.

1.2.5 Infallible Containments

Infallible containments are gas lines which, due to their design, can be regarded as permanently technically tight. This is achieved by, for example, welded joints, or metallically sealing joints (e.g. tap connectors and binders), providing they are seldom disconnected. Gas lines configured in this manner can be used for measuring noxious, flammable and explosive gases. At the time of going to press, infallible containments for thermal conductivity analysis (TC) are available; other analysis methods are projected. Further information about infallible containments can be found in the separate instruction manual supplied with these units.

Infallible containments do not render it unnecessary to test for leaks regularly, e.g. following lengthy breaks in service, substantial alterations, repairs and modifications.

Read the separate instruction manual giving detailed instructions on the configuration, operation and maintenance of units fitted with infallible containments.

1.2.6 Optional Components for Gas Lines

The analyzers can, as an option, be fitted with further components. Not all components are available for all analyzer types:

- internal sample gas pump
- internal valve block
- internal flow sensors
- internal flow monitor switch
- internal barometric pressure meters
- internal temperature sensors.

1.2.6.1 Internal Sample Gas Pump

An internal sample gas pump is used when the sample gas is under insufficient pressure. It ensures a constant flow of sample gas (max. 2.5 l/min through the analyzer).

When in internal pump is fitted, the relevant parameter in the software setup dialog is set to **Yes** (☞ 6.2.3.5, page 6-43). The pump can be controlled either manually through a software menu or optionally by a digital input.

1.2.6.2 Internal Valve Block

The use of an internal valve block allows all necessary gas lines (zero gas, span gas, sample gas) to remain permanently connected to the analyzer. Valves are then activated automatically when required (e.g. during automatic calibration).

When an internal valve block is fitted, this is shown in the relevant software setup dialog as either **Internal** or **Int+Ext** (☞ 6.2.3.5, page 6-43). The valves are controlled by either a software menu, optionally by digital input, or automatically during autocalibration.

Depending on the model, up to two valve bocks can be fitted.

1.2.6.3 Internal Flow Sensor

Up to two internal flow sensors can measure the flow of gas and can activate an alarm signal in the event of a failure. The alarm level for flow sensors is operator adjustable to up to 2000 ml/min. Depending on the model, up to two sensors can be fitted and evaluated separately.

When a sensor is fitted, the relevant parameter in the software setup dialog is set to **Yes** (☞ 6.2.3.5, page 6-43).

If the current flow rate is too low, a status message is displayed and the parameter under CHECK REQUESTS.. is set to **Yes** (☞ Chapter 8 “Troubleshooting”).

1.2.6.4 Internal Flow Monitor Switch

An internal flow switch monitors the gas flow and activates an alarm signal in case it is not sufficient. The alarm level for the internal flow switch is fixed and not operator adjustable. Additional external switches may used and connected via digital inputs. All fitted flow switches are evaluated to share a common alarm.

When an internal flow switch is fitted, the relevant parameter in the software setup dialog is set to **Yes** (☞ 6.2.3.5, page 6-43).

If the current flow rate is too low, a status message is displayed and the parameter under CHECK REQUESTS.. is set to **Yes** (☞ Chapter 8 “Troubleshooting”).

1.2.6.5 Internal Barometric Pressure Sensor

The influence of varying atmospheric pressure can be compensated for by the use of an internal barometric pressure sensor (☞ measurement specification, page 3-17).

If such a sensor is installed in the unit, the related menu shows the entry **Internal** (☞ 6.2.3.5, page 6-43).

1.2.6.6 Internal Temperature Sensors

The influence of varying temperatures can be compensated for by the use of internal temperature sensors (☞ measurement specification, page 3-17).

Depending on the configuration of the unit or the demands of the application, temperature sensors can measure the unit's internal temperature or selected measurement channel components.

If such sensors are installed in the unit, this is indicated in the installed options menu (☞ 6.2.3.5, page 6-43).

1.2.6.7 Optional Heated Area

The physical components can be optionally separated from the electrical components by means of a special box (not an option for ½ 19 in units). This can be done for one or both of the following purposes:

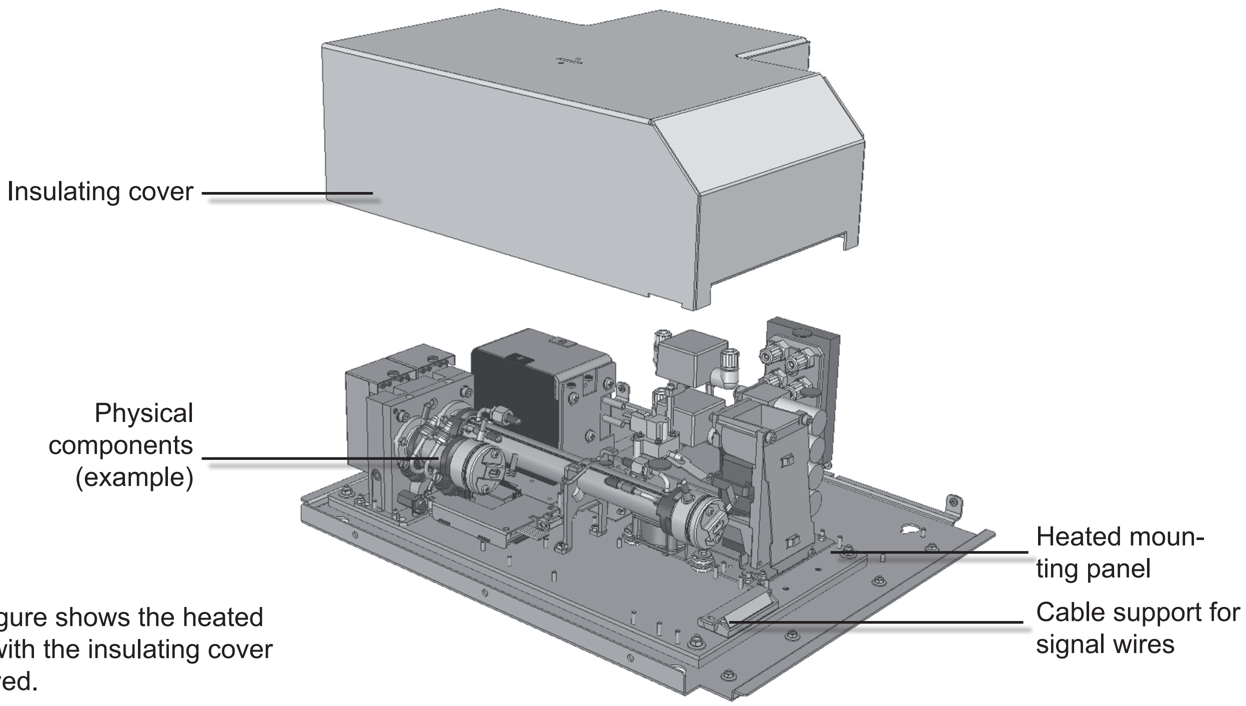
Firstly, the box allows the physical components to be regulated to a temperature of approx. 60°C, avoiding condensation of gases or the influence of varying environmental temperatures.

Secondly, the box can be purged with, for example, inert gas. The purge gas is first fed through a separate fitting, purges the electronic components, then floods the box and leaves the instrument via another fitting.

Purging in this manner can be useful when measuring very low concentrations (e.g. of CO or CO_2): the expulsion of ambient air avoids adulterant outside influences.

Alternatively, purging can be used to secure enhanced protection for electronic parts and operators from corrosive or toxic gases: any leaking gas is expelled from the housing and does not escape into the vicinity of the unit or come into contact with any electronic components located outside the box.

In either case, the purge gas outlet should be connected to an exhaust gas line.



The figure shows the heated area with the insulating cover removed.

Fig. 1-2: Optional Heated Area

1.2.7 Configurations

Depending on the application and the selected analyzer options, several gas line configurations are available, exemplified in the following diagram of a dual-channel analyzer:

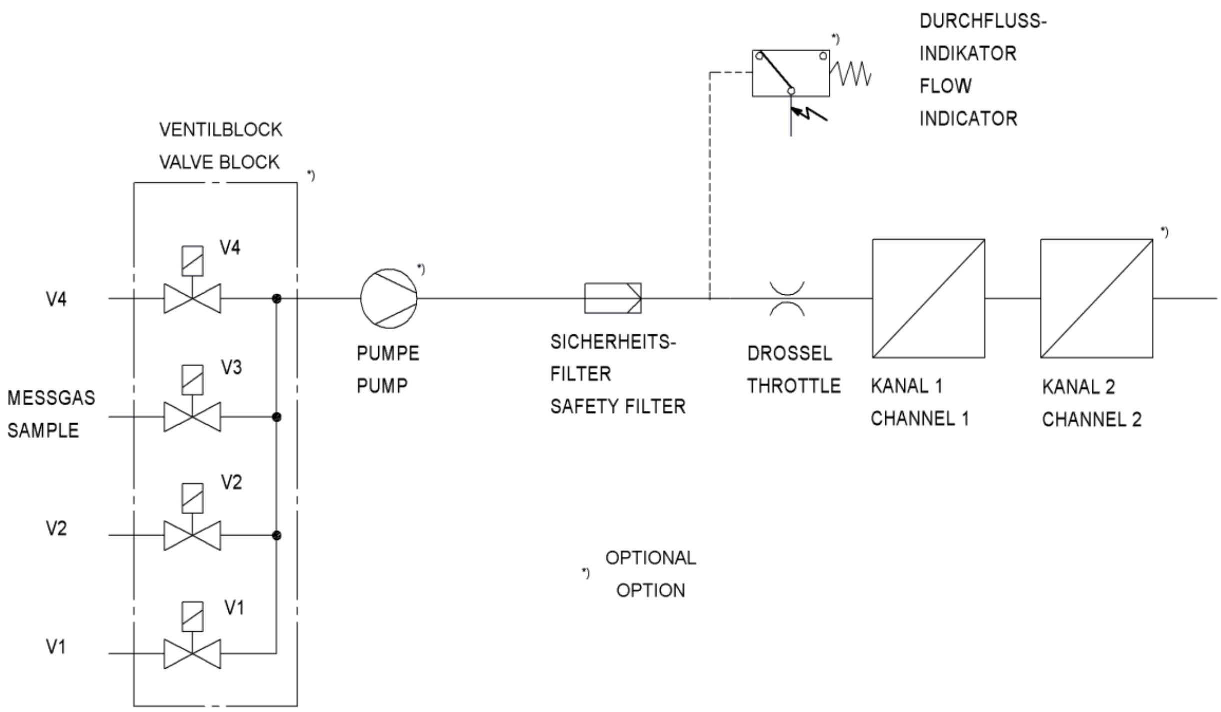


Fig. 1-3: Gas Flow Diagram: Single Channel or in Series

1.3 Interfaces

All analyzer types are fitted with one analog electrical output for each channel and four status relays as standard.

As an option, further interfaces can be added.

Depending on the unit configuration, all interfaces are accessible via either SubminD connectors or screw terminals.

1.3.1 Analog Outputs

Each X-STREAM analyzer is fitted with one output per channel as standard, which can transmit data on concentration levels to an external data acquisition system.

The mode of operation (e.g. 4-20 mA, 0-20 mA) and support for NAMUR NE 43 specifications (incl. Live Zero) can be set in a software menu (☞ 5.7.4, page 5-20).

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

X-STREAM analyzers support up to four analog outputs, which, however, do not always need to be assigned to measurement channels which are physically present: if a unit has less than four channels, the remaining analog outputs can be used to transmit concentration levels with a different resolution; for example, a single-channel analyzer could be set up as follows:

Output 1: 0…100 % CO_2 = 4…20 mA

Output 2: 0…25 % CO_2 = 4…20 mA

1.3.2 Status Relays

By default, the four relays are configured to signal the current status of the unit according to the NAMUR NE 44 recommendations (“Failure”, “Maintenance request”, “Out of specification” and “Function check”). However, the operator can assign different functions to the relays via software menus. For more information, see ☞ 6.2.3.4.2, page 6-37 ff.

Note!
The NE 44 status is also indicated by the LEDs on the front panel. These LEDs remain conformant to NE 44 even when the status relays are assigned different functions by the software.

The contacts, which can take a maximum load of 30 V at 1 A and 30 W, can be operated as normally open or normally closed.

Further information on the status relays is provided in the chapter “Technical Data” ☞ 2.1, pages 2-2 ff!

1.3.3 Optional Interfaces

1.3.3.1 Modbus Interface, Serial

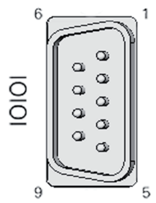
A serial interface with the Modbus protocol allows communication with external data acquisition systems. The interface enables the exchange and modification of measurement and analyzer signals as well as the remote activation of procedures.

The RS 485 interface is electrically isolated from the unit's electronic components and facilitates the construction of a network of several analyzers.

Optionally, an RS 232 interface can also be used (and is also electrically isolated from the unit's electronic components; however, it only allows communication between two end devices.

All supported Modbus parameters are listed in chapter 9.

A table nearby the connector shows the interface configuration (here: MODBUS)



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

Fig. 1-4: Serial Interface Marking

1.3.3.2 Modbus Interface, Ethernet

The Ethernet Modbus interface offers the same form of comunication with a data acquisition system as does a serial interface. The most obvious difference is the plug-and-socket connection: the Ethernet interface uses an RJ45 socket.

This interface is also electrically isolated from the unit's electronic components and enables the construction of a network of several analyzers.

All supported Modbus parameters are listed in chapter 9.

Note!
The Ethernet Modbus interface cannot be combined with the serial Modbus interface (☞ 1.3.3.1).

1.3.3.3 Digital Outputs

Digital outputs can be used for various purposes:

- Issuing concentration alarms: Process control systems can detect when limits are exceeded and trigger appropriate actions.
- Switching external components: For example, during automatic calibration, the necessary valves can be activated directly by the analyzer.

Digital outputs can be integrated into the units in groups of 9 or 18 (☞ 1.4, page 1-12).

The relay contacts, which can take a maximum load of 30 V at 1 A and 30 W, can be operated as normally open (NO) or normally closed (NC).

1.3.3.4 Digital Inputs

Digital inputs can:

- trigger calibration procedures, for example by a process control system
- remotely control valves and the optional sample gas pump (in concert with correctly configured digital outputs).

Digital inputs can be integrated into the units in groups of 7 or 14 (☞ 1.4, page 1-12).

Electrical details

LOW: $U_{in} \leq 1,5$ V
HI2GC: $U_{in} \geq 4,5$ V
Input impedence: 57,5 kΩ
Common ground for all outputs (“IN-GND”)

The inputs are protected against excess voltages of up to approx. 40 V. An open (not wired) input has LOW potential.

1.4 Comparison of the Various X-STREAM X2 Analyzer Models

X-STREAM X2GK	X-STREAM X2GP
	
½19 in housing, table-top or rackmountable, *optional with carrying handle* protection type: IP 20	⅟19 in housing, table-top or rackmountable, protection type: IP 20
Internal wide range power supply, **or** 24V input with external power supply unit	Internal wide range power supply unit
Max. 3 channels in many combinations max. 8 gas connections, *including 1 optional purge gas connection*	Max. 4 channels in any combination max. 8 gas connections, *1 optional extra connection for purge gas*
Options for gas lines: Valve block, sample gas pump, flow sensor, pressure sensor, infallible gas lines	*Options for gas lines: Flow sensor, pressure sensor, heating for physical components, sample gas pump, 1 or 2 valve blocks, infallible gas lines*
1–4 analog outputs, 4 relay outputs *optional:* *1 interface card with 7 digital inputs and 9 digital outputs* *1 Modbus interface (serial or Ethernet)* electrical interfaces accessible via sockets on back of unit*)*	1–4 analog outputs, 4 relay outputs *optional:* *1 or 2 interface cards, each with 7 digital inputs and 9 digital outputs* *1 Modbus interface (serial or Ethernet)* electrical interfaces accessible via sockets on back of unit, *optionally: screw-type terminal adapters (except for Ethernet)*
LCD	LCD
Operational ambient temperature*): 0 °C to +50 °C (32 °F to 122 °F)	Operational ambient temperature*): 0 °C to +50 °C (32 °F to 122 °F)
Available w/o front plate controls as module XCC	Available w/o front plate controls as module XCA
Size: (DxHxW): max. ca. 460x128.7x213 mm Weight: ca. 8–12 kg (17.6–26.5 lb)	Size: (DxHxW): max. ca. 411x133x482 mm Weight: ca. 11–16 kg (24–35 lb)
For more detailed information: ☞ section 1.5, page 1-14	For more detailed information: ☞ section 1.6, page 1-16

*): *Limitations apply to selected measurement principles and ranges,*
☞ Measurement specifications!

1.4 Overview of Analyzer Types

X-STREAM X2XF	X-STREAM X2FD
	
Stainless steel wallmountable fieldhousing, protection type: IP66 / NEMA 4X Single (XLF) or dual (XXF) compartment design	Cast aluminium wallmountable field housing, protection type: IP66 / NEMA 4X
Internal wide range power supply unit	Internal wide range power supply unit
Max. 4 channels in any combination max. 8 gas connections, *1 optional extra connection for purge gas*	Max. 4 channels in any combination max. 8 gas connections, *including 1 optional purge gas connection*
Options for gas lines: Flow sensor, pressure sensor, heating for physical components, sample gas pump, 1 or 2 valve blocks, infallible gas lines	*Options for gas lines: Flow sensor, pressure sensor, heating for physical components, sample gas pump, 1 or 2 valve blocks, infallible gas lines*
1–4 analog outputs, 4 relay outputs *optional:* *1 or 2 interface cards, each with 7 digital inputs and 9 digital outputs* *1 Modbus interface (serial or Ethernet)* electrical interfaces on internal screw-type terminal adapters (except for Ethernet)	1–4 analog outputs, 4 relay outputs *optional:* *1 or 2 interface cards, each with 7 digital inputs and 9 digital outputs* *1 Modbus interface (serial or Ethernet)* electrical interfaces on internal screw-type terminal adapters (except for Ethernet)
LCD, *optionally: vacuum fluorescent display, impact tested front panel*	LCD, impact tested front panel *optionally: vacuum fluorescent display*
operational ambient temperature*): -20 °C to +50 °C (-4 °F to 122 °F)	operational ambient temperature*): -20 °C to +50 °C (-4 °F to 122 °F)
Models available for use in explosive environments	Flameproof enclosure: approved for use in explosive areas
Size: (DxHxW): max. ca. 222x460x520 mm Weight: max. ca. 26 kg (57 lb)	Size: (DxHxW): max. ca. 222x512x578 mm Weight: max. ca. 63 kg (138.5 lb)
For more detailed information: ☞ section 1.7, page 1-19	For more detailed information: ☞ section 1.8, page 1-26

1.5 X-STREAM X2GK: ½19 Inch Table-Top Unit

This compact model for general purposes can be fitted with up to three measurement channels in various combinations. Power is supplied by an internal wide range power supply or a separate external power supply unit.

By default the units are configured for tabletop use. A carrying handle is optional available which makes it easy to take the instrument to varying sampling points. For rack mounting a X2GK is fixed by screws located at the front panel.

Front panel

The analyzer's front panel consists of one 4x20-character alphanumeric LCD display, a membrane keyboard and three status LEDs (Fig. 1-4). The colors of the LEDs are based on the NAMUR NE 44 specifications. The LEDs are activated according to the NE 107 standards and correspond to the following status messages: "Failure", "Function check", "Out of specification" and "Maintenance request".

Connection to power supply

AC is supplied by an IEC chassis plug with power switch and fuse holders. The internal wide range power supply unit enables the analyzers to be used worldwide. DC 24 V power is supplied via a 3-pin socket at the rear of the unit.

Interfaces

The electrical connections for interface signals are provided via submin-D connectors, also mounted at the back of the unit (Fig. 1-4). For applications where screw-type terminals are preferred for connecting signal wires, optional adapters are available, which are mounted directly onto the submin-D connectors.

Interface signals

The number of connections varies according to the number of interfaces installed: a 25-pin submin-D socket terminal strip is always included, providing one analog output (4-20 or 0-20 mA) and the contacts for the four NAMUR status relays.

Further analog outputs can also be provided, e.g. to provide a measurement signal at different resolutions. A maximum of four analog outputs are possible.

A serial Modbus interface can also be installed on request (RS 232 or RS 485 with Modbus RTU protocol, via 9-pin submin-D male connector); alternatively an RJ45 socket can also give access to Ethernet-Modbus-TCP.

Digital inputs and outputs can be used to control analyzer functions and external components. The 7 inputs and 9 outputs are connected to peripheral devices via a 37-pole submin-D socket terminal strip.

Detailed technical details on the various interfaces can be found in ☞ 1.3, page 1-9. The configuration of the connectors are described in ☞ chapter 4 "Installation" and the software settings in ☞ chapter 6 "Software".

A further submin-D socket, which is not in detail described in this manual, is also located at the rear of the unit, and is designated as a Service Interface.

The Service Interface is electrically connected to the unit's electronic components. If it is incorrectly handled, damage to the unit may result.
The Service Interface may only be used by EMERSON service personnel or specially trained staff.

1.5 X-STREAM X2GK

Gas connections

Depending on the configuration of the unit (number of measurement channels and serial or parallel connection), sample and calibration gases are fed into the unit via up to 8 tube fittings mounted on the rear panel. The configuration of the fittings is indicated on an adhesive label located near the tube fittings.

Any free tube fittings can be used for purging the device with

- inert gas to minimize interference from the ambient atmosphere when measuring small concentrations (e.g. of CO_2)

or

- air or inert gas when measuring corrosive and/or flammable gases.

For further information, see ☞ page 1-5.

Special components

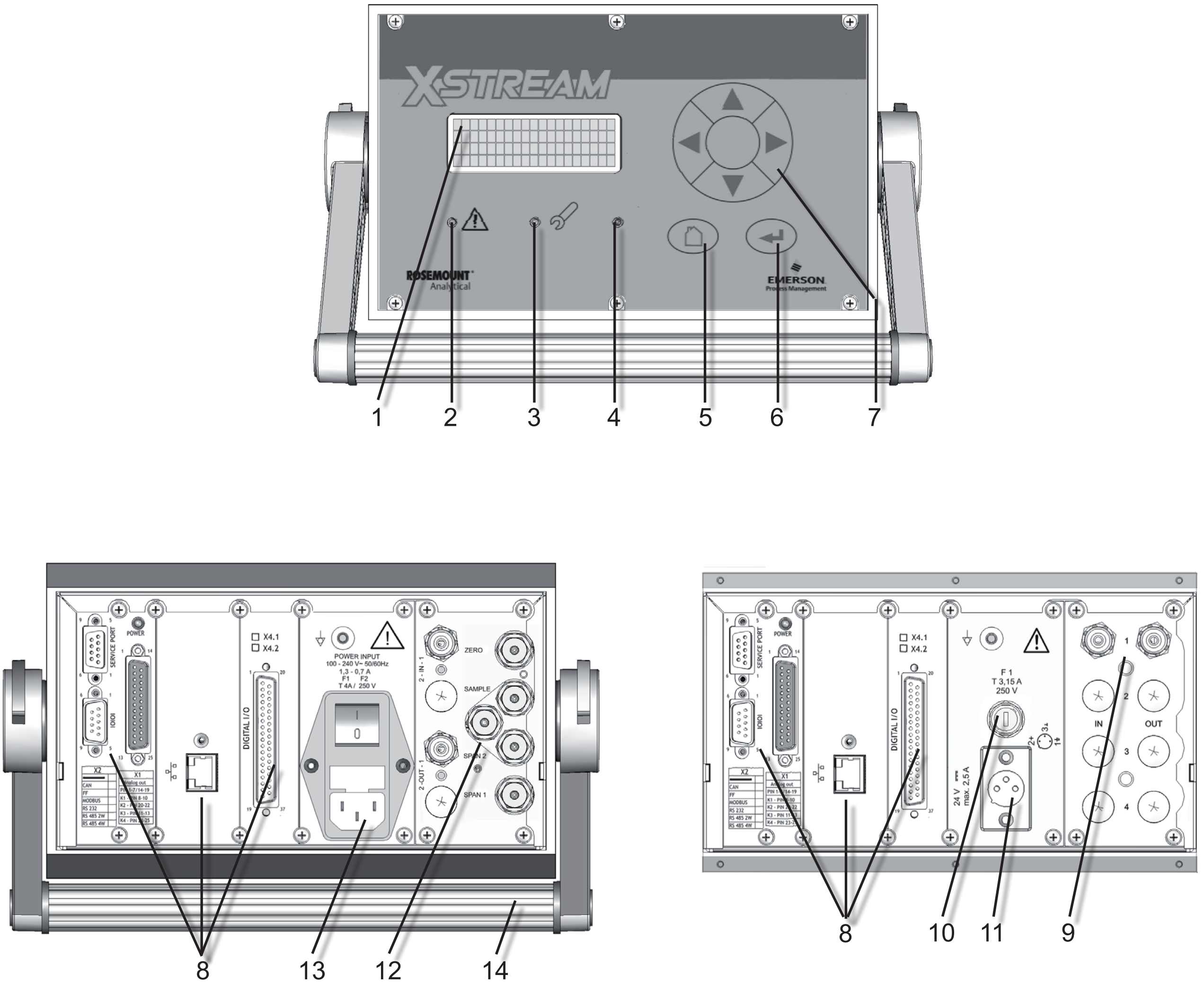
For the analysis of aggressive and/or flammable gases, infallible components (WLD; photometer under development) can be used. The risk of an uncontrolled release of gases due to a leak can be minimized by the use of stainless steel piping and clamping rings. Further details about the infallible containment are in the separate manual supplied with units containing such parts.

Furthermore, intrinsically safe measuring cells, which prevent the ignition of gas mixtures in the case of a failure, can also be used.

Modul variation XCC

The ½19-in unit is also available as an analyzer module without the front control panel, which can, for example, be integrated into a measuring system in which control and analysis of data is performed via interface by an external data acquisition system.

1.5 X-STREAM X2GK



Note!
Figures show optional components!

1	4x20 character alphanumeric display	8	Signal connectors (some optional)
2	LED (red)	9	Gas fittings
3	LED (red)	10	DC power input fuse
4	LED (green)	11	DC power input
5	“Measure” key	12	Valve block
6	“Enter” key	13	AC power input with integral fuses and switch
7	4 keys for adjustment and menu selection	14	Carrying handle

Fig. 1-5: X-STREAM X2GK - Views

1.6 X-STREAM X2GP: 19 Inch Table-Top or Rackmount Design

This model can be fitted with up to four measurement channels in any combination. The physical components can optionally be encased in a cover. This area can be held at a specific temperature of up to 60 °C to minimize interference from changes in external temperature.

Units configured for rack mounting can be converted for tabletop use by removing the lateral mounting brackets and attaching the four feet supplied as accessories.

Front panel

The analyzer's front panel consists of one 4x20-character alphanumeric LC display, a membrane keyboard and three status LEDs (Fig. 1-5). The colors of the LEDs are based on the NAMUR NE 44 specifications. The LEDs are activated according to the NE 107 standards and correspond to the following ststus messages: “Failure”, “Function check”, “Out of specification” and “Maintenance request”.

Connection to power supply

Main power is supplied via the IEC chassis plug mounted on the rear panel, with integrated power switch and fuse holders. The internal wide range power supply unit enables the analyzers to be used worldwide.

Interfaces

Electrical connections for interface signals are provided via the submin-D connectors also mounted on the rear panel of the device (Fig.1-5).

For applications where screw-type terminals are preferred for connecting signal wires, optional adapters are available, which are mounted directly onto the submin-D connectors.

Interface signals

The number of connections varies according to the number of interfaces installed: a 25-pin submin-D socket terminal strip is always included, providing one analog output (4-20 or 0-20 mA) and the contacts for the four (NAMUR) status relays. Further analog outputs can also be provided, e.g. to provide a measurement signal at different resolutions. A maximum of four analog outputs is possible.

A serial Modbus interface can also be installed on request (RS 232 or RS 485 with Modbus RTU protocol, via 9-pin submin-D male connector); alternatively an RJ45 socket can also give access to Ethernet-Modbus-TCP.

Digital inputs and outputs can be used to control analyzer functions and external components. The 7 inputs and 9 outputs are connected to peripheral devices via a 37-pole sumbin-D socket terminal strip. The number of digital inputs and outputs can be doubled (to 14 inputs and 18 outputs) by adding a second card. The first digital I/O card is marked "X4.1" while the second is "X4.2" on the rear panel, right above the connector (Fig. 1-5, rear view).

Detailed technical details on the various interfaces can be found in ☞ 1.3, page 1-9. The configuration of the connectors and the optional screw-type terminal adapters is described in ☞ chapter 4 “Installation” and the software settings in ☞ chapter 6 “Software”.

A further submin-D socket, which is not described in this manual, is also located at the rear of the unit, and is designated as a Service Interface.

1.6 X-STREAM X2GP

The Service Interface is electrically connected to the unit's electronic components. If it is incorrectly handled, damage to the unit may result.
The Service Interface may only be used by EMERSON service personnel or specially trained staff.

Gas connections

Depending on the configuration of the unit (number of measurement channels and serial or parallel connection), sample and calibration gases are fed into the unit via up to 8 threaded connectors mounted on the rear panel. The configuration of the connectors is indicated on an adhesive label located near the connectors.

An additional, optional connection can be used for purging the device with

- inert gas to minimize interference from the ambient atmosphere when measuring small concentrations (e.g. of CO_2)

or

- air or inert gas when measuring corrosive and/or flammable gases.

For further information, see ☞ section 1.2.6, page 1-5.

Special components

For the analysis of aggressive and/or flammable gases, infallible components (WLD; photometer under development) can be used. The risk of an uncontrolled release of gases due to a leak can be minimized by the use of stainless steel piping and clamping rings. Further details about the infallible containment are in the separate manual supplied with units containing such parts.

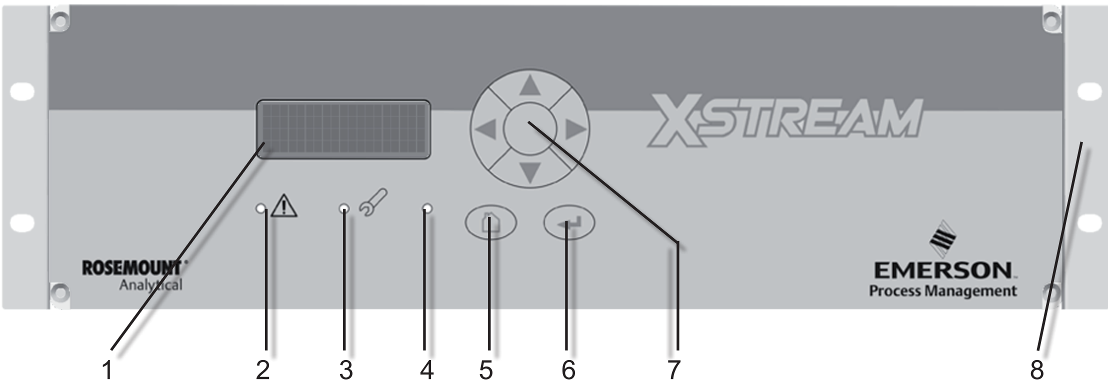
Furthermore, intrinsically safe measuring cells, which prevent the ignition of gas mixtures in the case of a failure, can also be used.

Module type XCA

The full 19-in unit is also available as an analyzer module without the front control panel, which can, for example, be integrated into a measuring system in which control and analysis of data is performed via interface by an external data acquisition system.

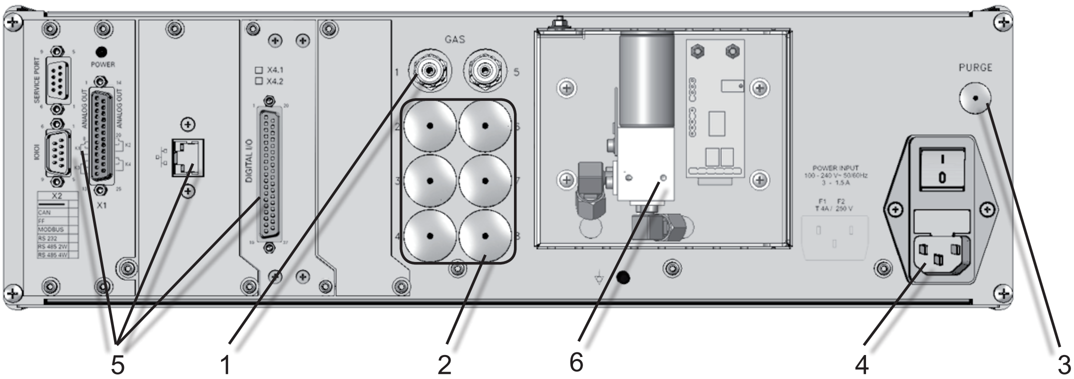
1.6 X-STREAM X2GP

Front view



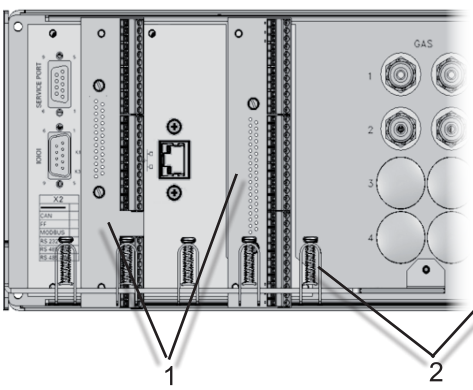
1 4x20 character alphanumeric display
2 LED (red)
3 LED (red)
4 LED (green)
5 “Measure” key
6 “Enter” key
7 4 keys for adjustment and menu selection
8 Brackets for rack mounting

Rear view

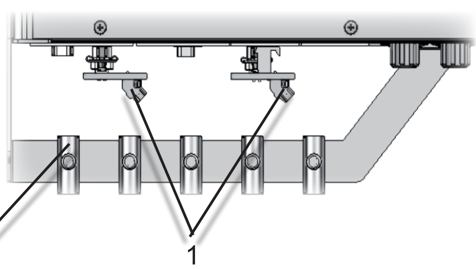


1 Gas connectors
2 Space for additional tube fittings
3 Optional purge gas inlet
4 Power inlet with filter, fuses & switch
5 Signal input/output connectors (some optional)
6 Cover for eO_2 or tO_2 sensor

Optional screw-type terminal adapter



Strain-reliefs, top view details



1 Screw-type terminal adapters
2 Strain-reliefs

Fig. 1-6: X-STREAM X2GP - Views

1.7 X-STREAM X2XF: Field Housing With (XLF) Single Or (XXF) Dual Compartment

Field housings are conceived for outdoor use and wall-mounting. The coated stainless steel housing has a protection class rated at IP66 / NEMA 4X, offering protection against water and dust entering the device:

*IPx**6**: In case of occasional flooding, e.g. heavy seas, water shall not enter in harmful quantities*

*IP**6**x: Protection against penetration by dust. Live or internal moving parts are completely protected.*

An X-STREAM field housing can be fitted with up to four measurement channels in any combination. The physical components can optionally be encased in a cover. This separate volume can be held at a specific temperature of up to 60 °C to minimize interference from changes in external temperature.

Front panel

The analyzer's front panel consists of one 4x20-character alphanumeric LC display, a membrane keyboard and three status LEDs (Fig. 1-6). The colors of the LEDs are based on the NAMUR NE 44 specifications. The LEDs are activated according to the NE 107 standards and correspond to the following status messages: "Failure", "Function check", "Out of specification" and "Maintenance request".

A vacuum fluorescent display can be fitted instead of the LCD, making the information displayed more easily readable in low light-levels. The display is covered by an impact tested glass to protect it in harsh environments.

Electrical connections

Electrical connections are provided via internal tube fittings, the cables being fed through cable glands at the right side of the unit (Fig. 1-8). The front cover of the housing swings open to the left once the fasteners have been released.

Connection to power supply

Mains power is supplied via the screw-type terminals with integrated fuse holders at the right of the housing, near the front. The wide range power supply unit mounted internally enables the analyzers to be used worldwide.

Interface signals

In the basic configuration, the unit has 36 internal screw-type terminals for interface signals, providing one analog output (4[0]-20 mA) and the contacts for the four (NAMUR) status relays. Further analog outputs can also be provided, e.g. to provide a measurement signal at different resolutions. A maximum of four analog outputs is possible.

A serial Modbus interface can also be installed on request (RS 232 or RS 485 with Modbus RTU protocol); alternatively an RJ45 socket gives access to Ethernet-Modbus-TCP.

Digital inputs and outputs can be used to control analyzer functions and external components. The 7 inputs and 9 outputs are connected to peripheral devices via a further 36-terminal strip. The number of digital inputs and outputs can be doubled (to 14 inputs and 18 outputs) by adding a second card and an additional 36-terminal strip.

Detailed technical information on the various interfaces can be found in ☞ 1.3, page1-9 The configuration of the terminals is described in chapter 4 "Installation" and the software settings in chapter 6 "Software".

A further submin-D socket, which is not in detail described in this manual, is also located inside the unit, and is designated as a Service Interface.

1.7 X-STREAM X2XF Field Housings

The service interface is electrically connected to the unit's electronic components. If it is incorrectly handled, damage to the unit may result.
The service Interface may only be used by EMERSON service personnel or specially trained staff.

Gas connections

Depending on the configuration of the unit (number of channels, series or parallel piping), up to eight tube fittings are provided for the supply of sample and calibration gases. The assignments of the fittings is given on an adhesive label situated near the fittings.

A further optional tube fitting enables the housing to be purged with either

- Inert gas to minimize interference from ambient atmospheres when measuring very small concentrations (e.g. CO_2)

or:

- air or inert gas whe measuring aggressive and/or flammable gases.

For further information, see ☞ section 1.2.6, page 1-5.

Special components

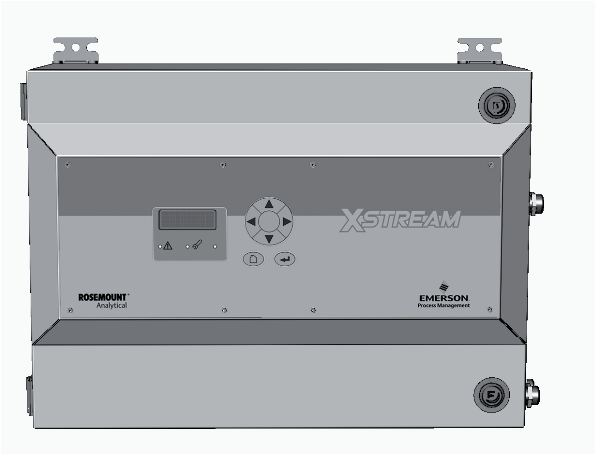
For the analysis of aggressive and/or flammable gases, infallible components (TCD) can be used. The risk of an uncontrolled release of gases due to a leak can be minimized by the use of stainless steel piping and clamping rings. Further details about the infallible containment are in the separate manual supplied with units containing such parts.

Furthermore, intrinsically safe measuring cells, which prevent the ignition of gas mixtures in the case of a failure, can also be used.

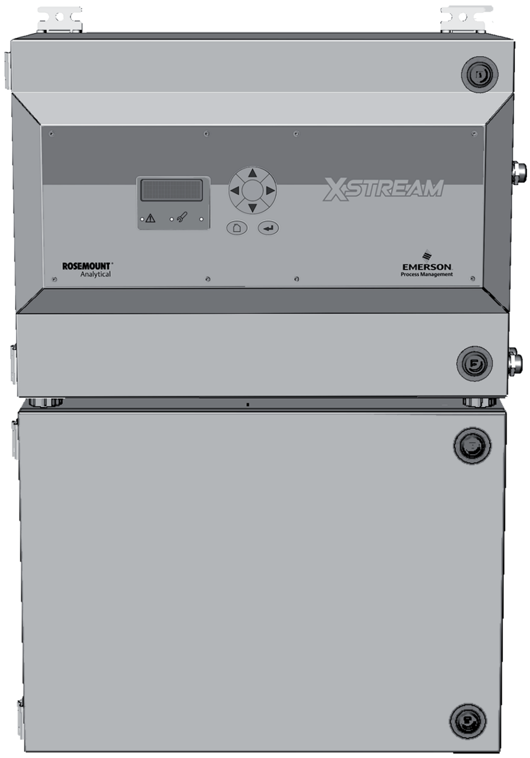
Dual compartment variation XXF

The dual compartment variation XXF supports separating electronics and physics, e.g. for measurement of corrosive or solvent gases. For such applications the electronics are installed in the upper compartment, while measurement physics are in the lower compartment. This separation is also available as gastight version.
XXF also provides more space e.g. for installation of optional signal converter elements for system integrators.

1.7 X-STREAM X2XF Field Housings



XLF



XXF

Fig. 1-7: X-STREAM X2XF Field Housings - Front Views

CAUTION

HEAVY INSTRUMENT

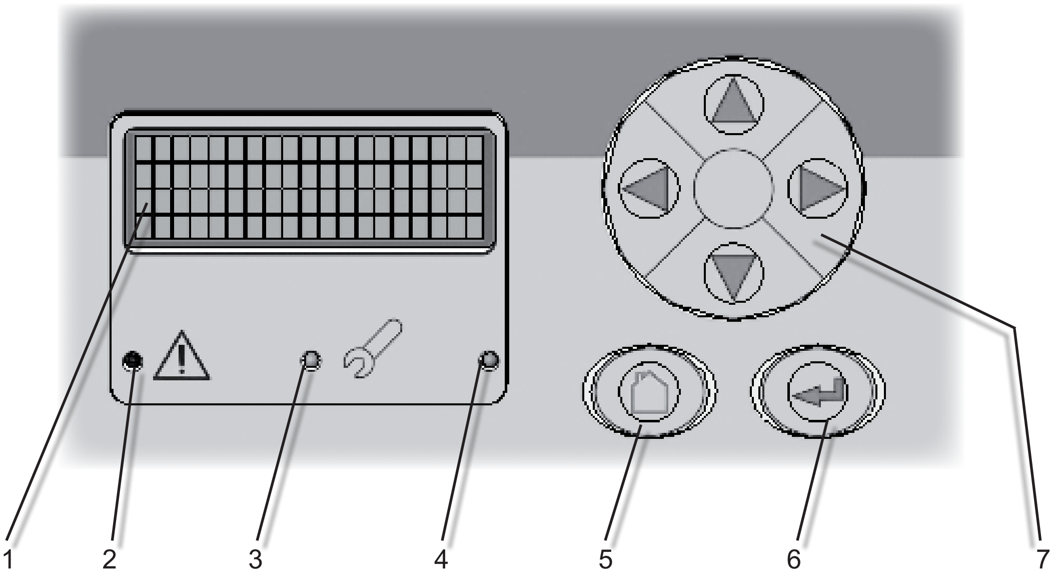
X-STREAM field housings, intended for outside and wall mounted use, weigh approx. (XLF) 26 kg (57 lb) or (XXF) 45 kg (99 lb), depending on options installed.

Two people and/or lifting equipment is required to lift and carry these units.

Take care to use anchors and bolts specified to be used for the weight of the units!

Take care the wall or stand the unit is intended to be installed at is solid and stable to support the weight!

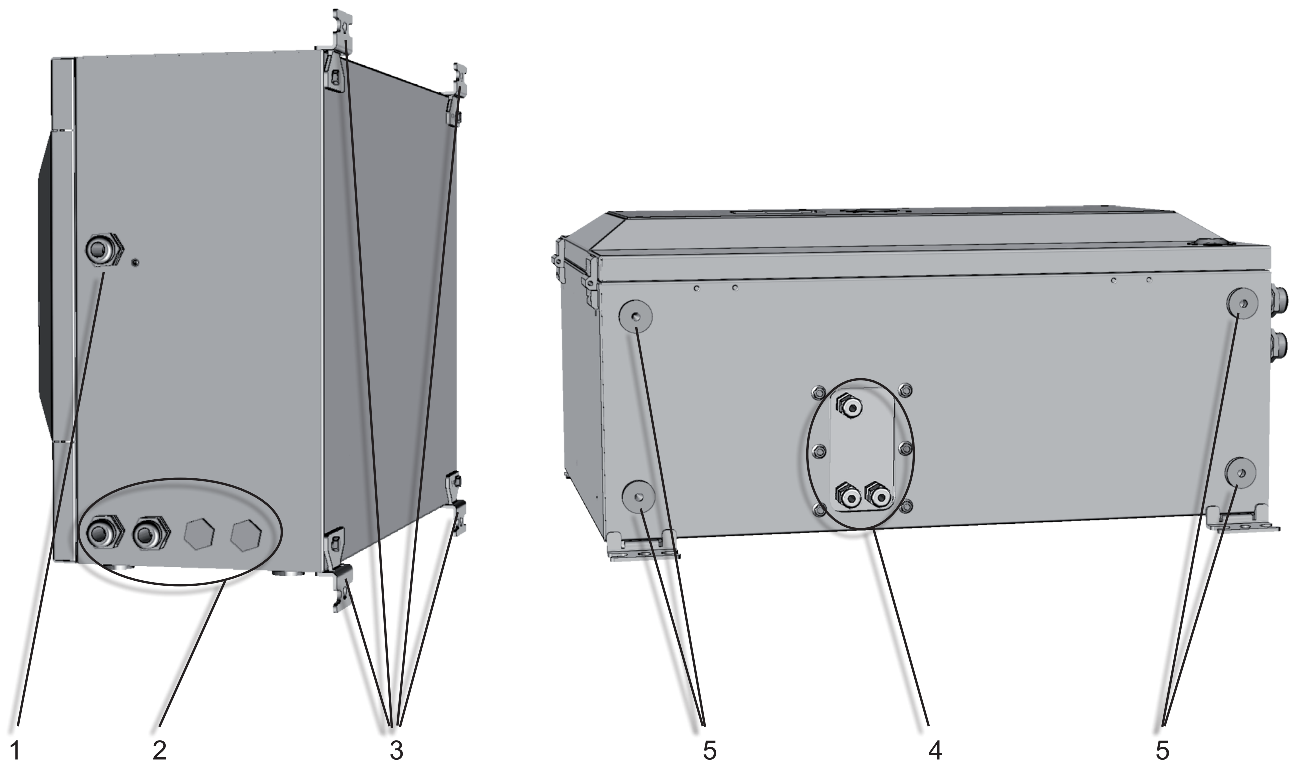
1.7 X-STREAM X2XF Field Housings



1	4x20 character alphanumeric display
2	LED (red)
3	LED (red)
4	LED (green)
5	“Measure” key
6	“Enter” key
7	4 keys for adjustment and menu selection

Fig. 1-8: X-STREAM X2XF Field Housings - Front Panel

1.7 X-STREAM X2XF Field Housings

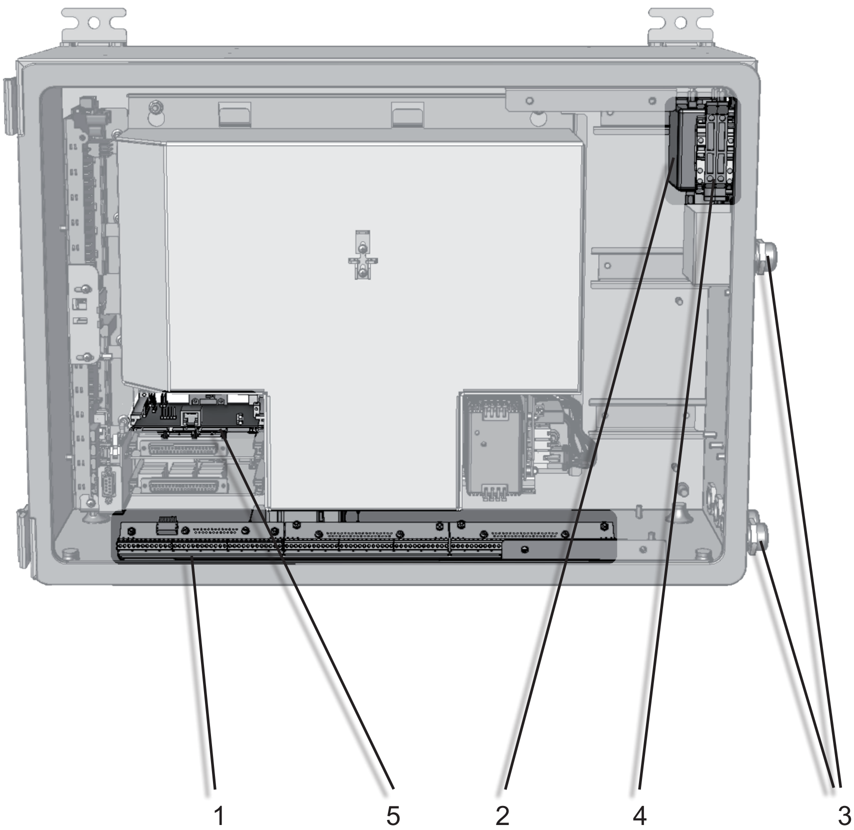


1 Cable gland for power cable
2 Cable glands for signal cables
3 4 brackets for wall-mounting
4 Gas in- & outlets (max. 8)
5 Cutouts, to combine 2 housings (here closed)

Note!
In case of XXF, the cable glands are located at the upper compartment, while the gas in- & outlets are at the bottom side of the lower compartment.
Also only 2 brackets are at each compartment.

Fig. 1-9: X-STREAM XLF - Bottom and Side View

1.7 X-STREAM X2XF Field Housings



(shown with front panel removed)

Note!
In case of XXF, the terminals and connectors are located at the upper compartment, while physical components and gas fittings are in the lower compartment.

1 Screw-type terminals for signal cables
2 Power line filter
3 Cable glands
4 Power supply terminals with integrated fuses
5 Ethernet connector

Fig. 1-10: X-STREAM XLF - Power Supply and Signal Terminals

1.7 X-STREAM X2XF Field Housings

1.7.1 Field Housing for Installation in Hazardous Areas (Ex-Zones / Divisons)

WARNING

DANGER OF EXPLOSION

The standard X-STREAM X2XF field housings CAN NOT be used in explosive environments without additional security features.

This instruction manual does NOT describe the special conditions necessary to operate gas analyzers in explosive areas.

Please refer to the separate instruction manual supplied with units for use in explosive areas.

Special X-STREAM field housing analyzer models can be used in Ex-zones 2 or Division 2:

X-STREAM XLFN/XXFN:

Analyzer with non-sparking protection for measuring non-flammable gases in European Ex-zone 2 and North-American Division 2 areas: the customized configuration of this instrument ensures that, when used correctly, no sparks, hot surfaces etc. which could ignite an explosive ambient atmosphere are generated. No further measures, such as a supply of protective gas, are necessary.

X-STREAM XLFS/XXFS:

Equipped with a simplified pressurized enclosure, these models can be used to measure non-flammable gases in European Ex-zone 2. A protective gas (e.g. pressurized air) must be supplied when operating this model.

X-STREAM XLFZ/XXFZ:

Equipped with a simplified pressurized enclosure, these models can be used to measure non-flammable gases in American zone Div 2. A protective gas (e.g. pressurized air) must be supplied when operating this model.

Please contact your local EMERSON Process Management office if you require analyzers for use in explosive areas.

1.8 X-STREAM X2FD: Cast Aluminum Flameproof Housing

The most obvious X-STREAM 2FD analyzer feature is its flameproof housing (Fig. 1-10). This enables its use in Ex-zone 1 hazardous environments. With its protection type of IP66/ NEMA 4X and sturdy cast aluminum housing designed for wall-mounting, it can also be used in other tough environments.

*IPx**6**: In case of occasional flooding, e.g. heavy seas, water shall not enter in harmful quantities*

*IP**6**x: Protection against penetration by dust. Live or internal moving parts are completely protected.*

Up to four measuring channels in any combination can be installed in the X-STREAM X2FD. Optionally, a cover can be installed over the physical components. This separate volume can be heated up to a maximum temperature of 60 °C to minimize the effects of changes in external temperature.

A description of the different piping options is given in ☞ section 1.2.6, page 1-5.

Front panel

The front panel is physically protected with a safety glass panel and consists of a 4x20-character alphanumeric LC display, a keypad and 3 status LEDs (Fig. 1-11). The colors of the LEDs are based on the NAMUR NE 44 specifications. The LEDs are activated in line with NE 107 standards and indicate “Failure”, “Function check”, “Out of specification” and “Maintenance request”. Instead of the LCD display, a vacuum fluorescent display can be fitted.

Electrical connections

Electrical connections are made via internal screw-type terminals; the corresponding cables are fed through cable inlets on the underside of the unit into the housing (Fig. 1-12). The front of the unit opens downwards once the screws located on the surrounding flange are removed.

Power supply

Mains power is connected via screw-type terminals with integrated fuses, located in the front right-hand area of the housing. The internally mounted wide range power supply unit ensures the analyzers can be used worldwide.

Interface signals

In the basic configuration, the unit has 36 internal screw-type terminals for interface signals, providing one analog output (4–20 or 0–20 mA) for each channel and the contacts for the four NAMUR status relays. Further

WARNING

DANGER OF EXPLOSION

The special conditions for installing and operating analyzers in hazardous areas are not covered by this manual!

Read the separate instruction manuals shipped together with instrument intended to be installed in hazardous area!

analog outputs can also be provided, e.g. to provide a measurement signal at different resolutions. A maximum of four analog outputs is possible.

A serial Modbus interface can also be installed on request (RS 232 or RS 485 with Modbus RTU protocol); alternatively also access to Ethernet-Modbus-TCP. In this case the RS interface signals are routed to the appropriate number (up to 5) of the 36 terminals.

Digital inputs and outputs can be used to control analyzer functions and external components. The 7 inputs and 9 outputs are connected to peripheral devices via a further 36-terminal strip. The number of digital inputs and outputs can be doubled (to 14 inputs and 18 outputs) by adding a second card and an additional 36-terminal strip.

Detailed technical information on the various interfaces can be found in 1.3, page 1-9
The configuration of the terminals is described in chapter 4 “Installation” and the software settings in chapter 6 “Software”.

A further submin-D socket, which is not in detail described in this manual, is also located at the rear of the unit, and is designated as a Service Interface.

The Service Interface is electrically connected to the unit’s electronic components. If it is incorrectly handled, damage to the unit may result.
The Service Interface may only be used by EMERSON service personnel or specially trained staff

Gas connections

Depending on the configuration of the unit (number of channels, series or parallel piping), up to eight flame arresters are provided for the supply of sample and calibration gases. The assignments of the connectors is given on an adhesive label situated near the connectors.

Optional two of the fittings may be used to purge the housing with either

- inert gas to minimize interference from ambient atmospheres when measuring very small concentrations (e.g. CO_2)

or:

- air or inert gas when measuring aggressive and/or flammable gases.

For further information, see section 1.2.6, page 1-5.

Special components

For the analysis of aggressive and/or flammable gases, and depending on the analysis method used (photometer or TC), infallible components can be used. The risk of an uncontrolled release of gases due to a leak can be minimized by the use of stainless steel piping and clamping rings. Furthermore, for measuring oxygen in flammable atmospheres, intrinsically safe measuring cells, which prevent the ignition of gas mixtures in the case of a failure, can also be used.

1.8 X-STREAM X2FD

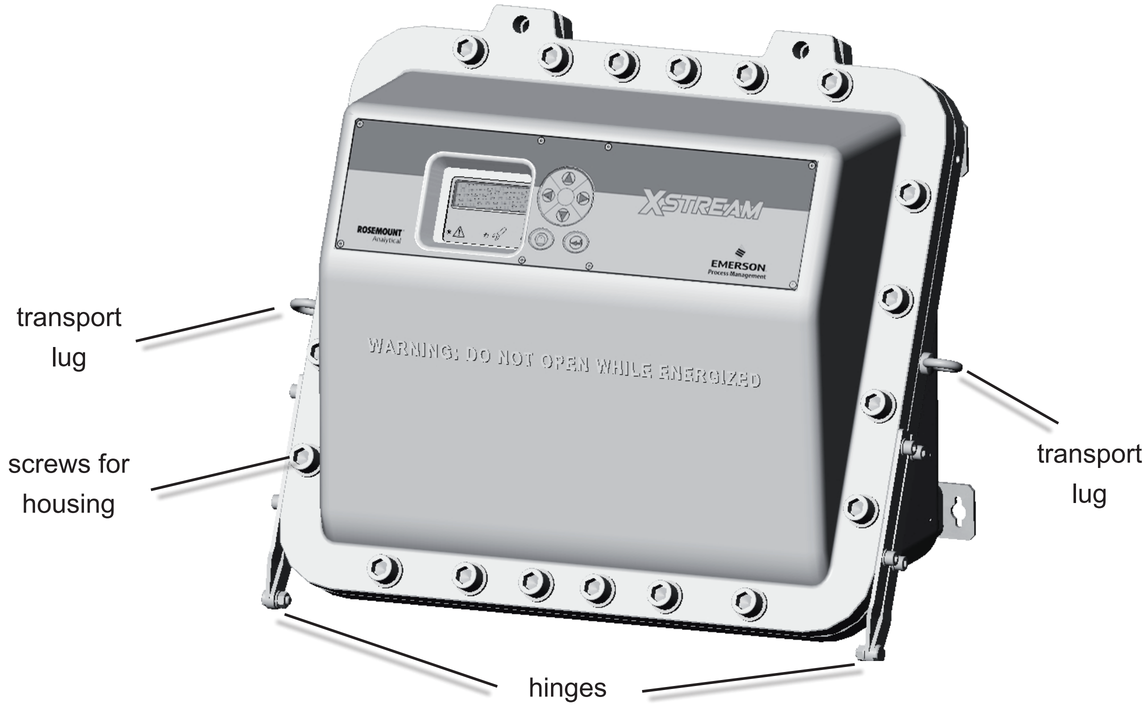


Fig. 1-11: X-STREAM X2FD - Front View

CAUTION

HEAVY INSTRUMENT

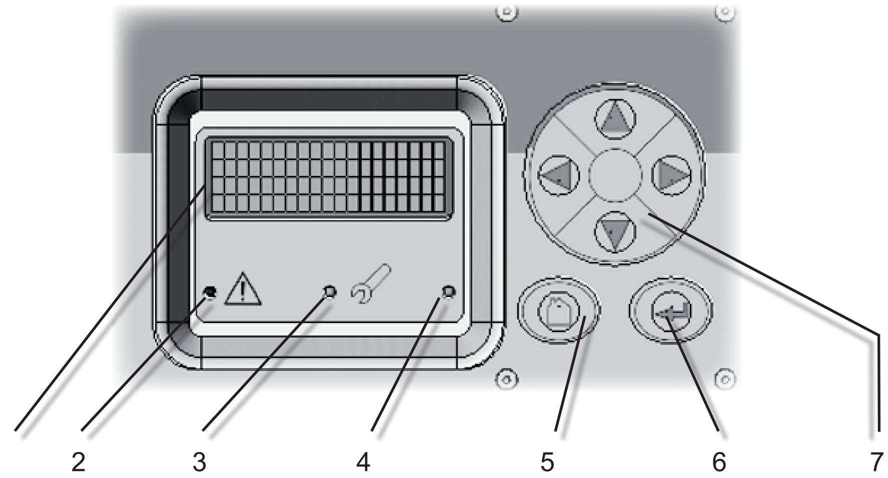
The model X-STREAM X2FD intended for outside and wall mounted use weighs approx. 63 kg (139 lb), depending on options installed.

Two people and/or lifting equipment is required to lift and carry these units. Use the lugs located on the sides of the instrument.

Take care to use anchors and bolts specified to be used for the weight of the units!

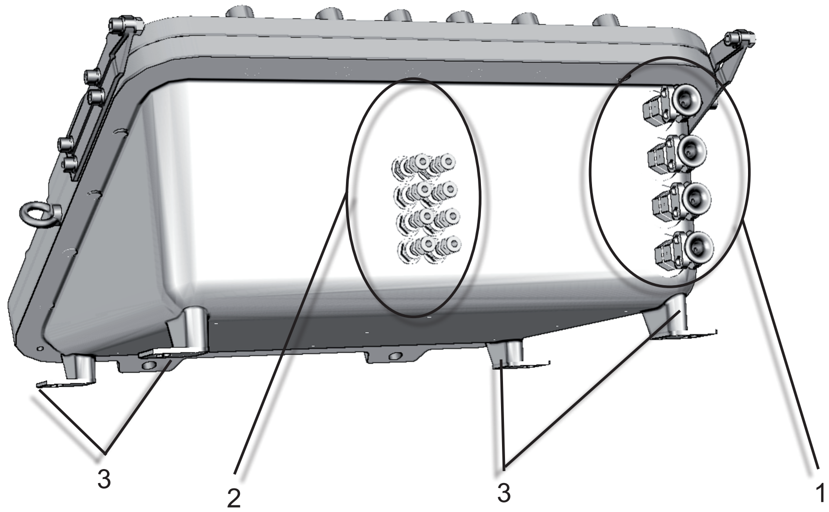
Take care the wall or stand the unit is intended to be installed at is solid and stable to support the weight!

1.8 X-STREAM X2FD



1 4x20 character alphanumeric display
2 LED (red)
3 LED (red)
4 LED (green)
5 "Measure" key
6 "Enter" key
7 4 keys for adjustment and menu selection

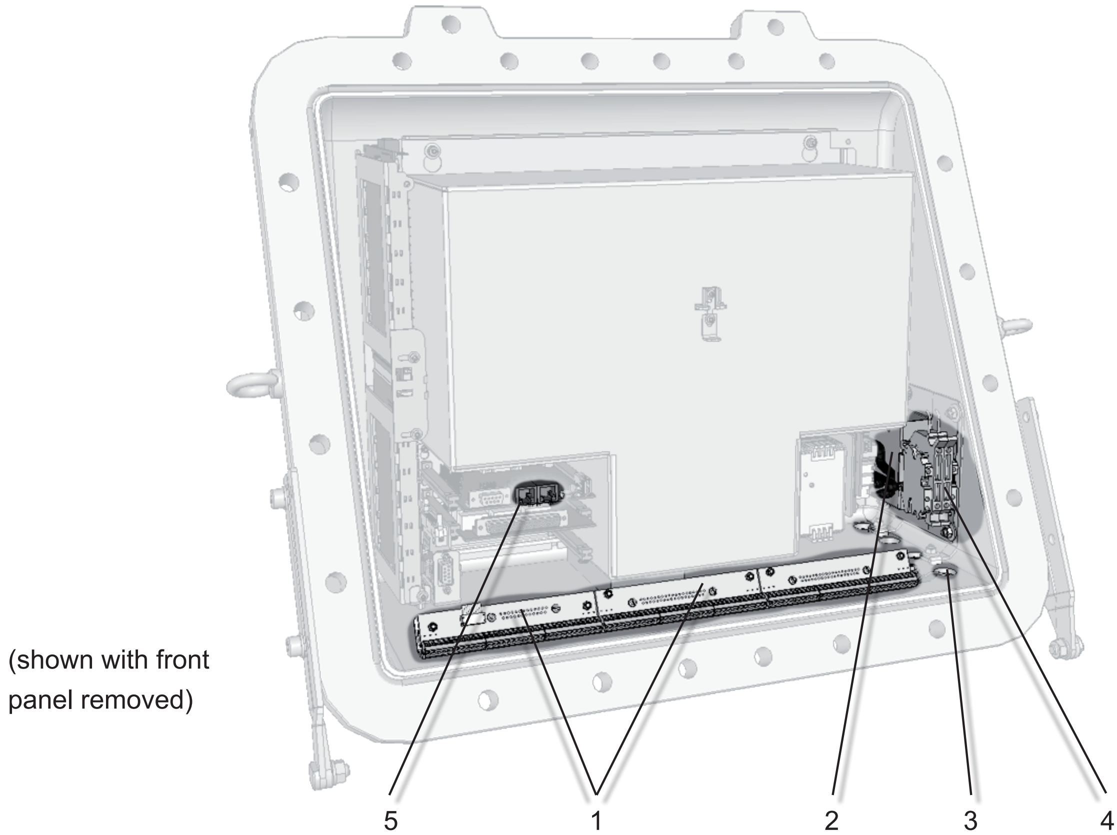
Fig. 1-12: X-STREAM X2FD - Front Panel



1 Cable inlets for power and signal cables
2 Gas tube fittings and purge gas outlet
3 4 brackets for wall mounting

Fig. 1-13: X-STREAM X2FD - Bottom View

1.8 X-STREAM X2FD



1 Terminals for signal cables (shown fully populated)
2 Power line filter
3 Cable inlets for power and signal cables
4 Power supply terminals with integrated fuses
5 Optional Ethernet connection

Fig. 1-14: X-STREAM X2FD - Terminals

Chapter 2
Technical data

This chapter contains all the technical details of the analyzers, divided into common and model-specific data.

Common technical data	☞	page 2-2
X-STREAM X2GK	☞	page 2-5
X-STREAM X2GP	☞	page 2-11
X-STREAM X2XF (XLF, XXF)	☞	page 2-15
X-STREAM X2FD	☞	page 2-18

2.1 Common Technical Data

Installation site

Humidity (non-condensing)	< 90 % RH at +20 °C (68 °F) < 70 % RH at +40 °C (104 °F)
Degree of pollution	2
Installation category	II
Elevation	0 to 2000 m (6560 ft) above sea level
Ambient atmosphere	Units may not be operated in corrosive, flammable or explosive (not applicable to X-STREAM X2FD) environments without additional safety measures.

Certification

Electrical safety	CAN / USA	CSA-C/US, based on CAN/CSA-C22.2 No. 61010-1-04 / UL 61010-1, 2nd edition
C US 185562	Europe	CE, based on EN 61010-1
Electromagnetic compatitiblity		
	Europe	CE, based on EN 61326
	Australia	C-Tick
	others	NAMUR

Gas parameters

☞ Chapter 3 “Measuring principles”

Purging options

☞ 4.3 "Gas Conditioning"

2.1 Common Technical Data

Interfaces, signal inputs and outputs

Interface signals are accessed in different ways depending on the analyzer model. (This does not apply to Ethernet, which always uses RJ45):

X-STREAM X2GK, X2GP: standard:	subminD plugs and sockets
optional:	screw-type terminal adapters
X-STREAM X2XF, X2FD:	internal screw-type terminals

All models are supplied with up to 4 analog outputs
(Standard: 1 analog output per channel)

4 (0)–20 mA ($R_B \leq 500\ \Omega$)
electrically isolated from each other and from other electronic components;

user-configurable activation and deactivation concentration levels; support for NAMUR NE 43 operation modes, configurable via keypad and Modbus

4 relay outputs

dry contacts,
max. load. 30 V; 1 A; 30 W resistive

Each output can be configured to one of the following functions:

NAMUR NE 107 status signal
- "Failure"
- "Maintenance request"
- "Out of specification"
- "Function check"

1 of 2 concentration limits per channel,
Control signals for
- external valve V1…V8,
- external sample gas valve
- external pump

Zoom status for analog outputs

2.1 Common Technical Data

Optional interfaces for all models

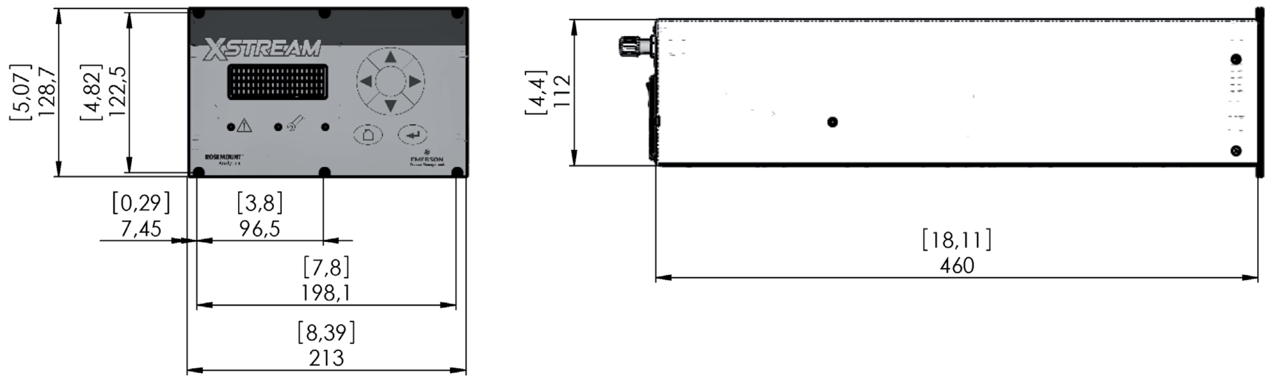
1 Modbus interface	RS 485 (2 or 4 wire) *optional:* *RS 232* *Ethernet (RJ45 socket)*

Digital inputs and outputs

7 or 14 digital inputs (X-STREAM X2GK: max. 7 inputs)	max. 30 V, internally limited to 2.3 mA HIGH: min. 4 V; LOW: max. 3 V (common GND)
Each input can be configured to one of the following functions:	Open valve V1…V8 Open sample gas valve Activate sample gas pump Zero calibrate all channels Span calibrate all channels Zero and span calibrate all channels Abort calibration Zoom analog output 1 Zoom analog output 2 Zoom analog output 3 Zoom analog output 4
9 or 18 additional relay outputs (X-STREAM X2GK: max. 9 addtn. outputs)	dry contacts, max. load. 30 V; 1 A; 30 W resistive
Each output can be configured to one of the following functions:	NAMUR NE 107 status signal “Failure” “Maintenance request” “Out of specification” “Function check” 1 of 2 concentration limits per channel, Control signals for external valve V1…V8, external sample gas valve external pump Zoom status display for analog outputs

2.2 Model-Specific Technical Data

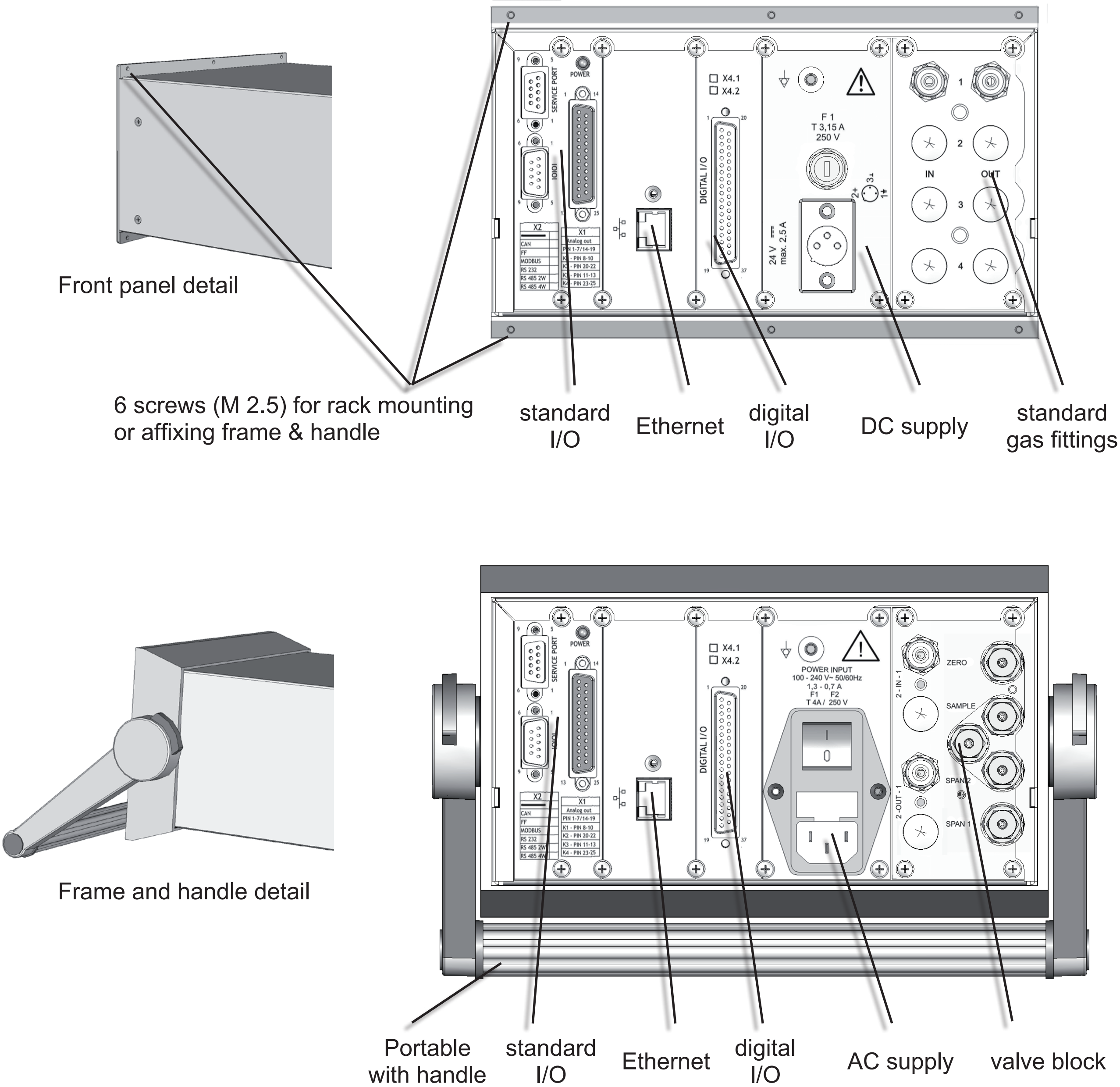
2.2.1 X-STREAM X2GK: ½19 Inch Table-Top Unit



All dimensions in mm
[inches in brackets]

Fig. 2-1: X-STREAM X2GK - Dimensions

2.2.1 Model-Specific Technical Data: X-STREAM X2GK



Note!
All shown variable options are interchangable!

Fig. 2-2: X-STREAM X2GK - Rear Panel and Handle Variations

2.2.1 Model-Specific Technical Data: X-STREAM X2GK

Housing

Max. operational ambient temperature range*):	0 °C to +50 °C (32 to 122 °F)
Max. ambient temperature range for storage:	-20 °C to +70 °C (-4 to 158 °F)
Weight (dependent on configuration)	approx. 8–12 kg (17.6–26.4 lb)
EN 60529 housing protection type:	IP 20 for indoor use. Units must be protected against dripping water and splashes, and direct sunlight.
Gas connections:	quantity: max. 6 of which optional: 1 or 2 for purge gas material: PVDF 6/4 mm optionally stainless steel 6/4 mm or ¼", other options on request

Power Supply

Instrument data

Nominal input voltage	24 V⎓	100–240 V 50/60 Hz
Input voltage range	10–30 V⎓	85–264 V, 47–63 Hz
Nominal input current	2.5 A max.	1.3–0.7 A max.
	Connection via 3-pin XLR connector on rear panel	Connection via IEC appliance on rear panel
Power Input fuse		
Data for fuse link:	AC 230 V / T 3.15 A / 5x20 mm (1 pcs)	AC 230 V / T 4 A / 5x20 mm (2 pcs)

Signal inputs and outputs

As standard, signal cables are connected using Submin-D plugs or sockets on the unit's rear panel (except Ethernet: RJ45 socket) (☞ Fig. 2-2)

Detailed terminal configuration ☞ 4.4.1 Installation, page 4-7.

**): Limitations apply to selected measurement principles and ranges,*
☞ Measurement specifications!

2.2.1 Model-Specific Technical Data: X-STREAM X2GK

2.2.1.1 Data for Optional External Power Supply Units

Model UPS 01 T

This PSU can be ordered as an option for supplying power to one table-top unit.

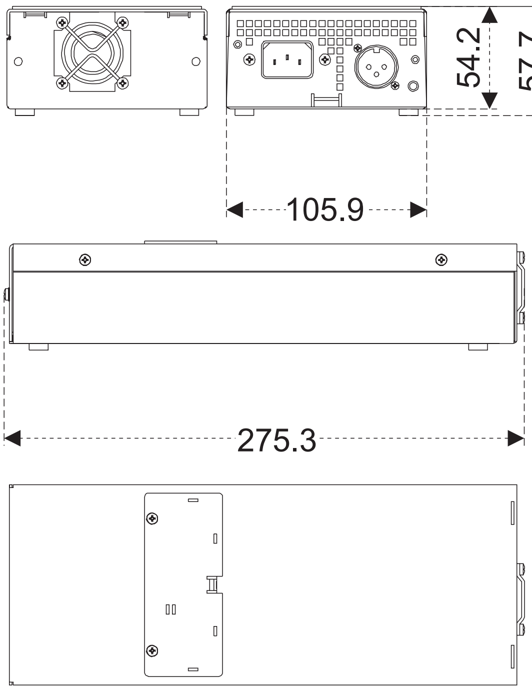
Nominal input voltage	120 / 230 V∼ 50/60 Hz
Input voltage range	95–138 V∼ / 187–264 V∼, 47–63 Hz
Power consumption	max. 240 VA
Connection via rubber connector (IEC plug; ☞ Fig. 2-2).	

Power input fuses

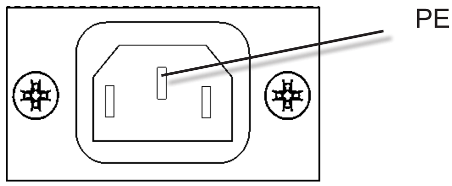
The PSU does not include user-replaceable fuses.

Nominal output voltage	24 V⎓ (± 5 %)
Nominal output current	5 A
Output	3-pin XLR socket
Surge protection	current limiting typ. 110% I_{nom}, straight response curve, short-circuit-proof
Excess temperature protection	reduction of output voltage to disconnection. Resets after cooling.
Weight	approx. 2.5 kg (4.8 lb)
Certification	
Safety	EN 60950, UL1950, CSA22.2 NO 950-95
EMC	EN 50081-1 (emitted interference) EN 50082-2 (interference resistance), et al.

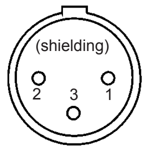
2.2.1 Model-Specific Technical Data: X-STREAM X2GK



Dimensions *(approx. values in [mm])*



IEC power input socket



Pin 1: ME
Pin 2: + 24 V⎓
Pin 3: 0 V (⊥)
shield: housing flange

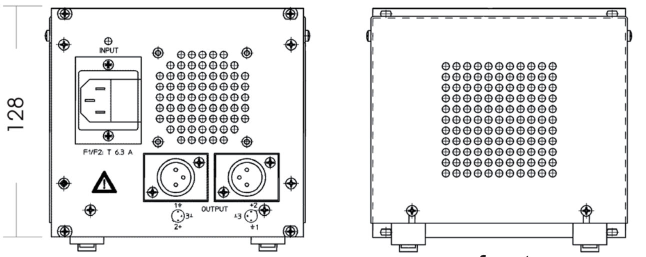
Pin configuration for 24 V DC output socket

Fig. 2-3: UPS 01 T Power Supply Unit

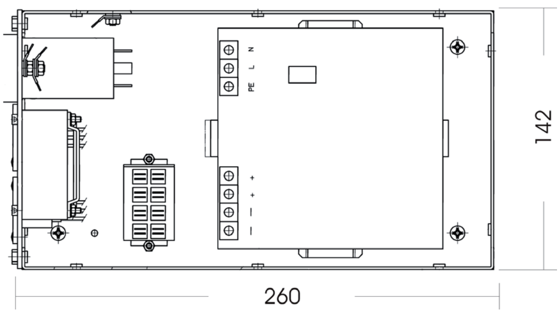
2.2.1 Model-Specific Technical Data: X-STREAM X2GK

Model: ***5 A or 10 A table-top PSU***

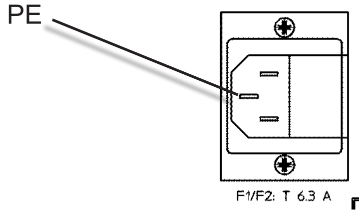
This PSU can be optionally ordered for powering 2 table-top units with a single common power supply.



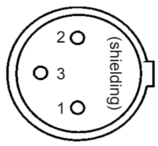
rear front



internal view (cover removed)



IEC power input connector with fuse-holder



Pin 1: ME
Pin 2: +24 V⎓
Pin 3: 0 V (⊥)
Shield: housing flange

Pin configuration for 24 V DC output socket

dimensions *(approx. [mm])*

Fig. 2-4: 10 A Table-Top PSU

Recommended clearance for cooling	15 mm (0.6 in) in front and behind
Weight:	approx. 2 kg (4.4 lb)
Nominal input voltage	100–120 / 220-240 V∿ 50/60 Hz (Configured by manufacturer as per order. Manually switching voltage requires opening the housing.)
Input voltage range	85–132 / 176–264 V∿, 47–63 Hz
Nominal input current	< 6 A (input voltage set to 115V) < 2,8 A (input voltage set to 230V)

Connection via rubber connector
(IEC connector) with fuse holder (☞ Fig. 2-4).

2.2.1 Model-Specific Technical Data: X-STREAM X2GK

Power input fuses	
Data for fuse link:	AC 230 V / T 6.3 A / 5x20 mm
Nominal output voltage	24 V⎓ (+ 5 %, -1 %)
Power consumption	max. 5 A or 10 A
Output	two 3-pin XLR sockets
Efficiency	typ. 89 % (230 VAC, 24 V / 10 A)
Power loss	typ. 29 W (230 VAC, 24 V / 10 A)
Surge protection	protection against short-circuits, power surges and no-load running
Excess temperature protection	derating from 60° C (140 °F)
Certification *(for internal power supply module only)*	
Safety	EN 60950, EN 50178, UL1950, CUL/CSA-22.2 No 950-M90
EMC	EN 50081-1, class B (emitted interference) EN 50082-2, class A (interf. resistance), et al.

2.2.2 X-STREAM X2GP: 19 Inch Table-Top and Rack-Mount Models

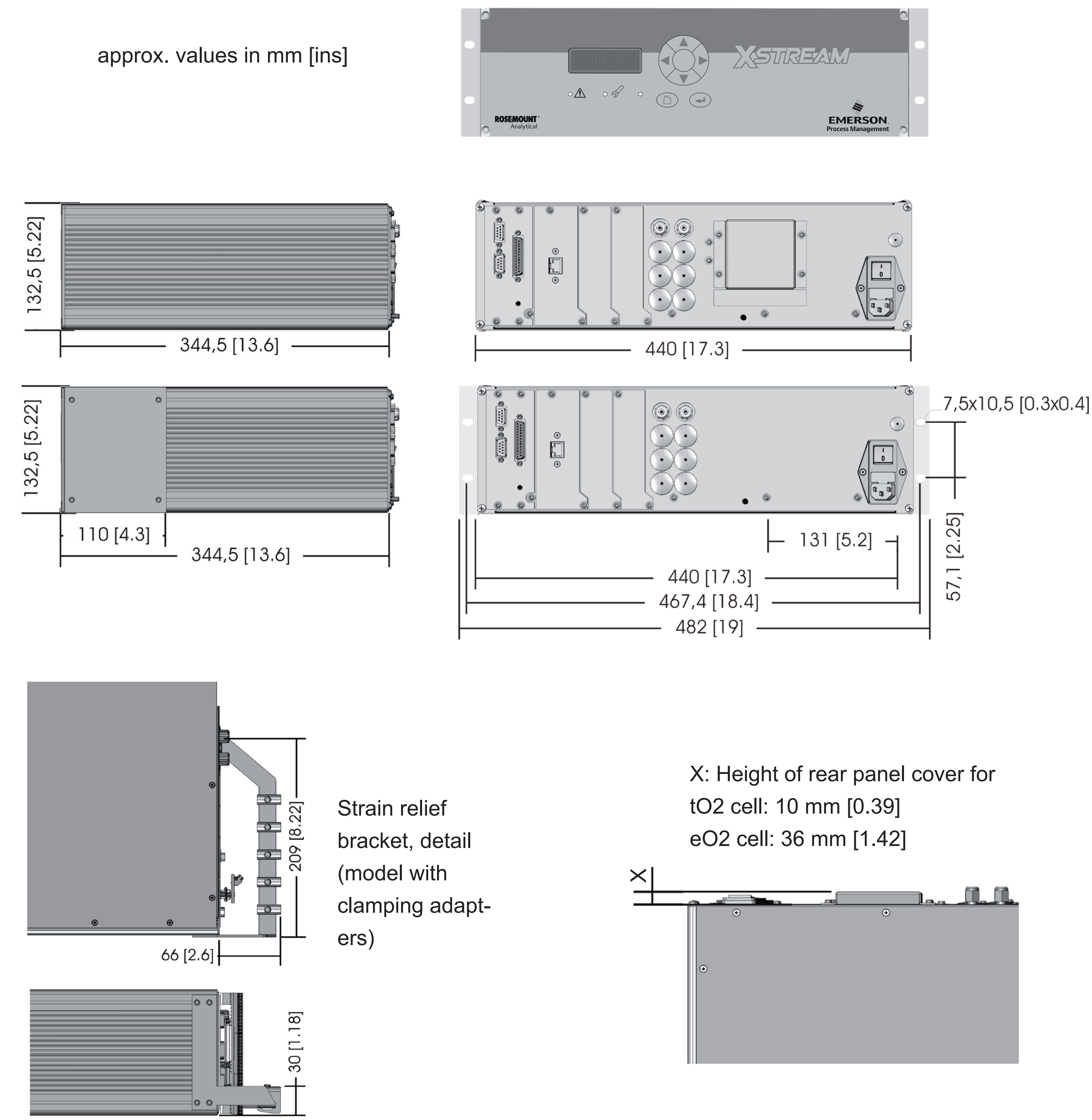


Fig. 2-5: X-STREAM X2GP - Dimensions

2.2.2 Model-Specific Technical Data: X-STREAM X2GP

Technical data **2**

Housing

Max. operational ambient temperature range*) :	0 °C to +50 °C (32 °F to 122 °F)
Max. ambient temperature range for storage:	-20 °C to +70 °C (-4 °F to 158 °F)
Weight:	approx. 12–16 kg (26.4–35.2 lb) (dependent on configuration)
EN 60529 housing protection type:	IP 20 for indoor use. Units must be protected against dripping water and splashes, and direct sunlight.

Gas connections:

quantity:	max. 8
optional	1 addit. purge gas connector
material:	PVDF 6/4 mm
optionally	stainless steel 6/4 mm or ¼", other options on request

*) *: Limitations apply to selected measurement principles and ranges,*
☞ Measurement specifications!

Power supply

Nominal input voltage	100–240 V∿ 50/60 Hz, global power supply unit
Input voltage range	85–264 V∿, 47–63 Hz
Nominal input current	
standard	1.3–0.7 A max.
with temperature control	3–1.5 A max.

Connection via rubber connector
(IEC connector) with power switch at rear of unit (☞ figs. 2-5 & 2-6).

Power input fuses

The IEC connector incorporates holders for two fuses.

Data for fuse links: AC 230 V / T 4 A / 5x20 mm

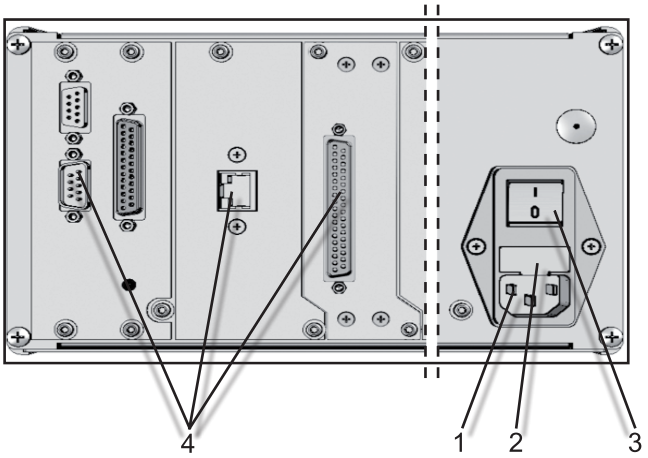
2.2.2 Model-Specific Technical Data: X-STREAM X2GP

Signal inputs and outputs

As standard, signal cables are connected using Submin-D plugs or sockets on the unit's rear panel (except Ethernet: RJ45 socket)(☞ Fig. 2-6)

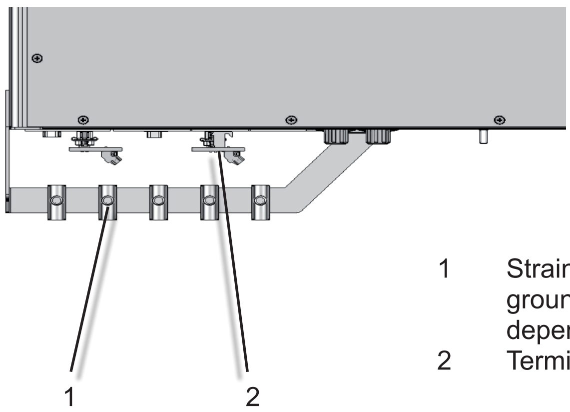
Detailed terminal configuration ☞ Installation, page 4-15.

Optionally, adapters can be plugged onto the Submin-D connectors to enable signal cables to be connected via screw-type terminals. In this case, an additional strain relief bracket for the signal cables is mounted on the rear panel (☞ Fig. 2-7):

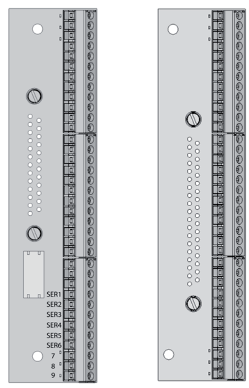


1 Power connector
2 Fuse holder
3 Power switch
4 Signal connectors (some optional)

Fig. 2-6: X-STREAM X2GP - Power Supply and Signal Connections



1 Strain relief with cable shield grounding clamps (quantity varies depending on installed options)
2 Terminal adapters



Terminal adapters (detail)

Fig. 2-7: X-STREAM X2GP - Signal Connections With Screw-Type Terminal Adapters (top View)

2.2.3 X-STREAM X2XF: Single (XLF) or Dual (XXF) Compartment Field Housing

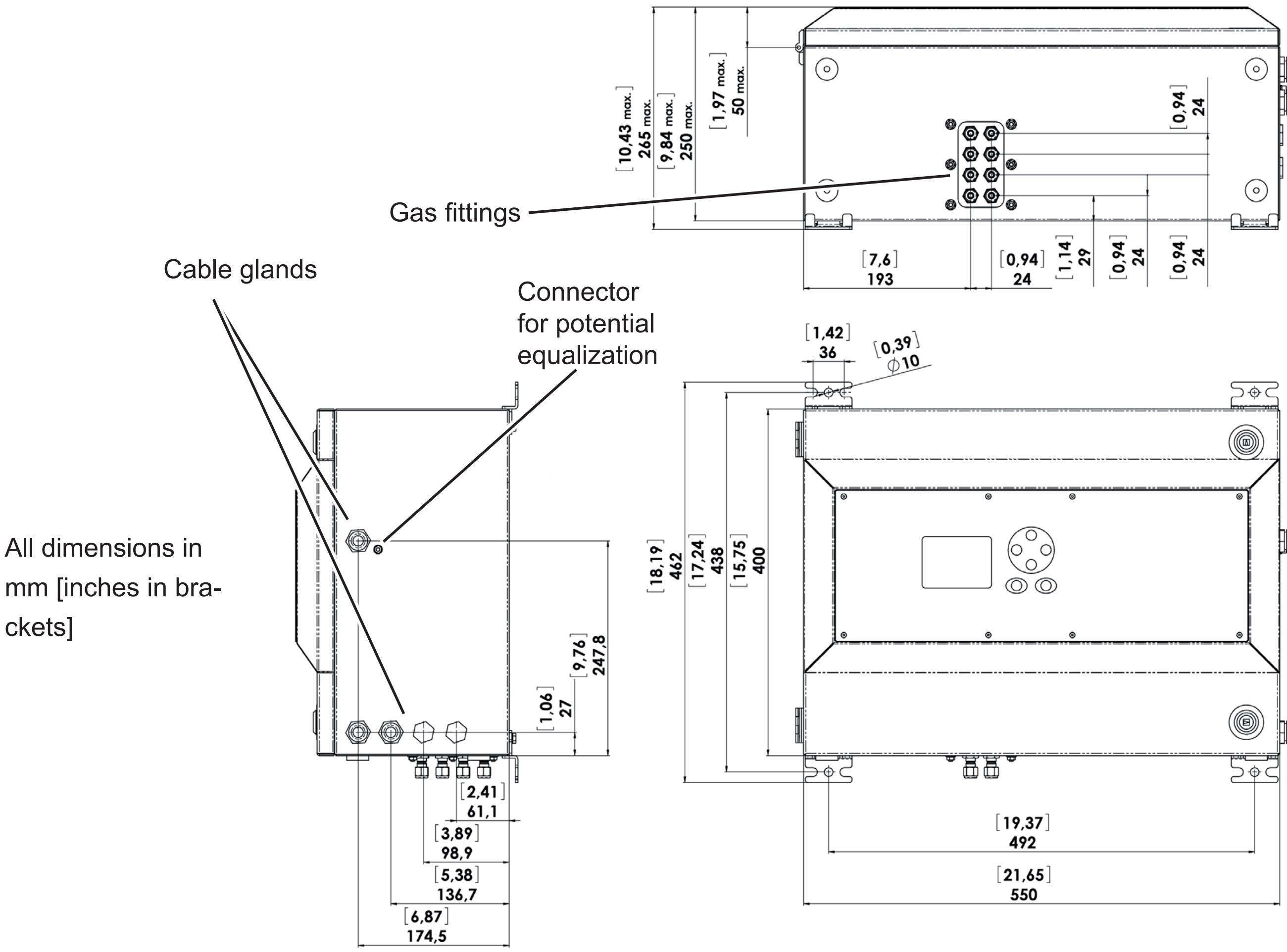


Fig. 2-8: X-STREAM XLF - Dimensions

2.2.3 Model-Specific Technical Data: X-STREAM X2XF Field Housings

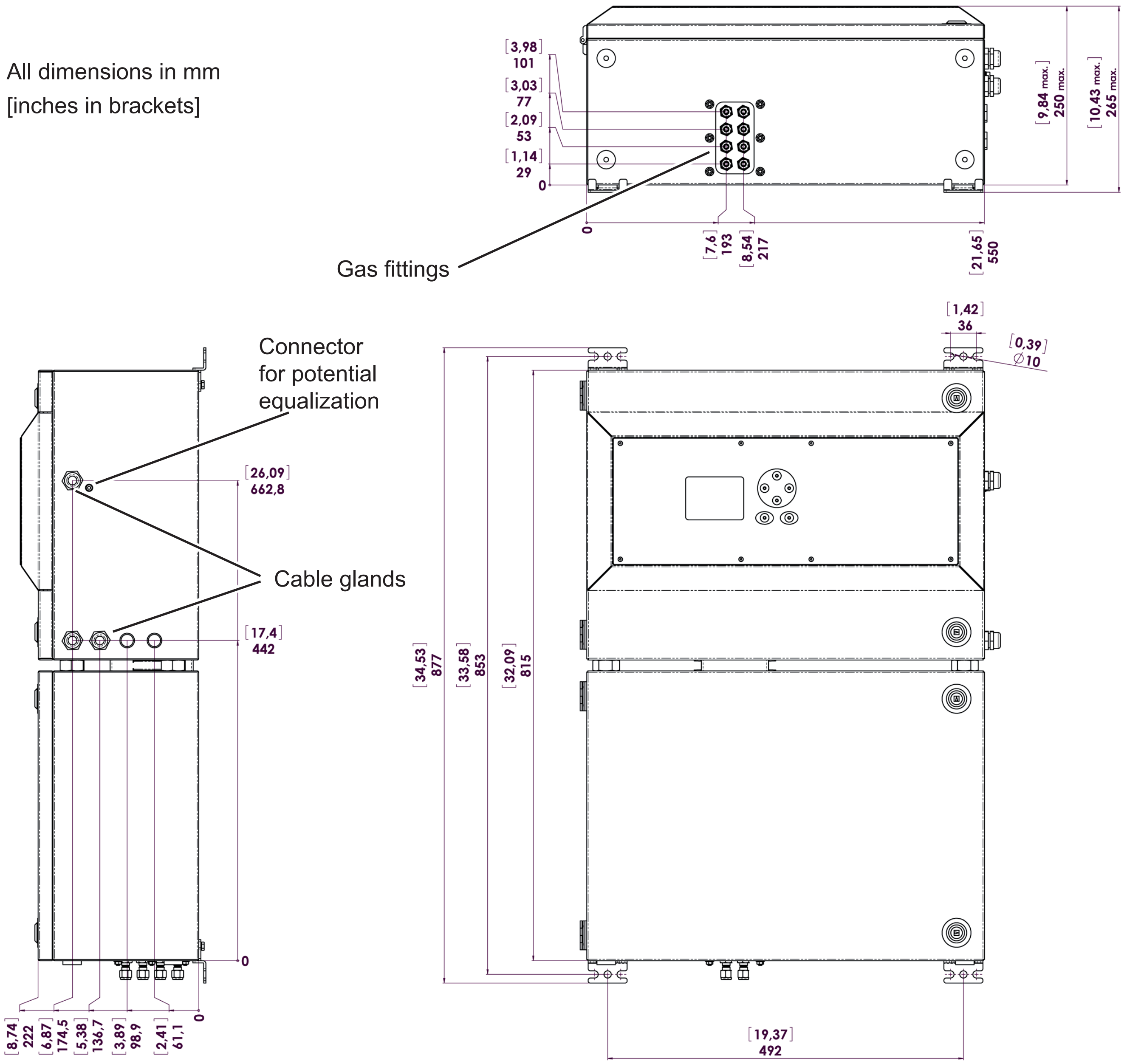


Fig. 2-9: X-STREAM XXF - Dimensions

2.2.3 Model-Specific Technical Data: X-STREAM X2XF Field Housings

Housing

Max. operational ambient temperature range*):		-20 °C to +50 °C (-4 °F to 122 °F)
Max. ambient temperature range for storage:		-20 °C to +70 °C (-4 °F to 158 °F)
Weight:	XLF	max. approx. 25 kg (57.2 lb)
	XXF	max. approx. 45 kg / 99.2 lb
Protection class:		IP 66 (EN 60529) / NEMA 4X for outdoor use to be protected against direct sunlight
Gas connections:	quantity:	max. 8
	optional	1 additional purge gas connector
	material:	stainless steel 6/4 mm or ¼", other options on request

Power supply

Nominal input voltage	100–240 V∿ 50/60 Hz, wide range power supply unit
Input voltage range	85–264 V∿, 47–63 Hz
Nominal input current	
XLF standard	1.3–0.7 A max.
with temperature control	3–1.5 A max.
XXF standard	1.5–0.8 A max.
with temperature control	5.5–3 A max.
	Connection via touch proof screw-type terminals internally mounted near the cable glands (Fig. 2-9).
Wire cross-section:	max. 4 mm^2, end sleeves not required.
Cable entry via	one IP 68 cable gland
Permissible cable outer diameter:	7–12 mm

Power supply fuses

Fuse holders are integrated within power supply terminals
Data for fuse links: AC 230 V / T 6.3 A / 5x20 mm

**): Limitations apply to selected measurement principles and ranges,*
☞ Measurement specifications!

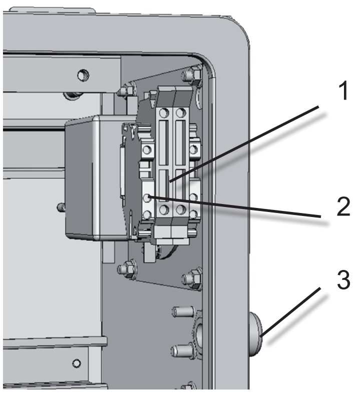
2.2.3 Model-Specific Technical Data: X-STREAM X2XF Field Housings

Signal inputs and outputs

All signal cables are connected to internal screw-type terminals located in the front area of the opened housing (Fig. 2-11).

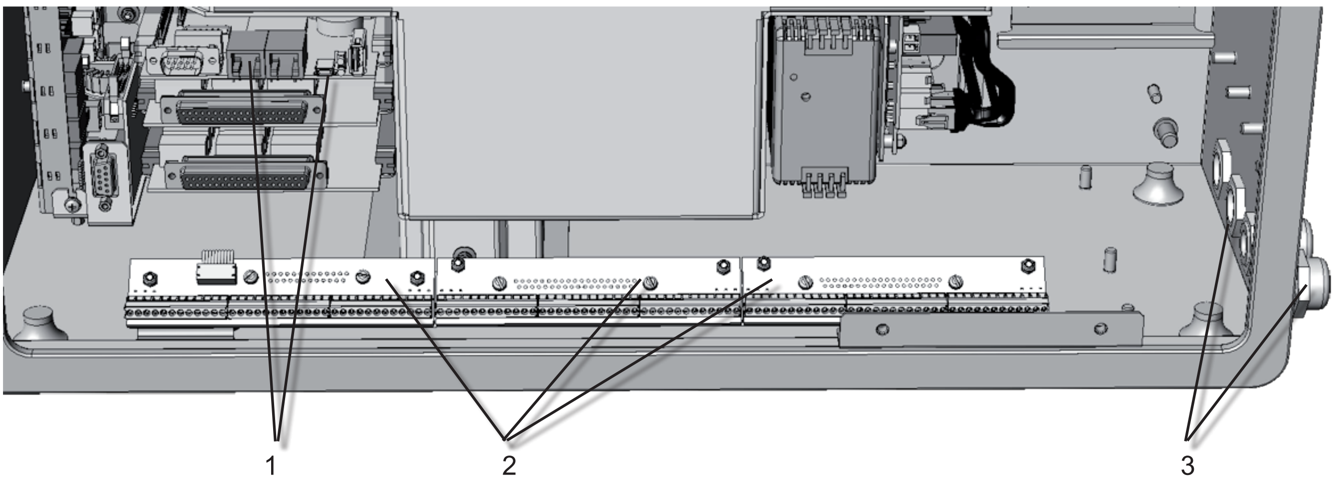
Cable cross-section:	max. 1.5 mm^2, end sleeves not required.
Cable entry via	three IP 68 cable glands
Permissible cable outer diameter:	7–12 mm

Detailed terminal configuration ☞ 4.4.3 Installation, page 4-21.



1 Power supply terminals with fuse holders
2 Grounded conductor clamp (PE)
3 Power supply cable entry

Fig. 2-10: X-STREAM X2XF Field Housings - Power Supply Terminals / Fuse Holders



1 Ethernet
2 Analog & digital I/O terminal strips
3 Max. 4 signal cables entries

Note!
Depending on the actual analyzer configuration not all shown terminals may be installed!

Fig. 2-11: X-STREAM X2XF Field Housings - Signal Terminals

2.2.4 Model-Specific Technical Data: X-STREAM X2FD

2.2.4 X-STREAM X2FD: Flameproof Housing

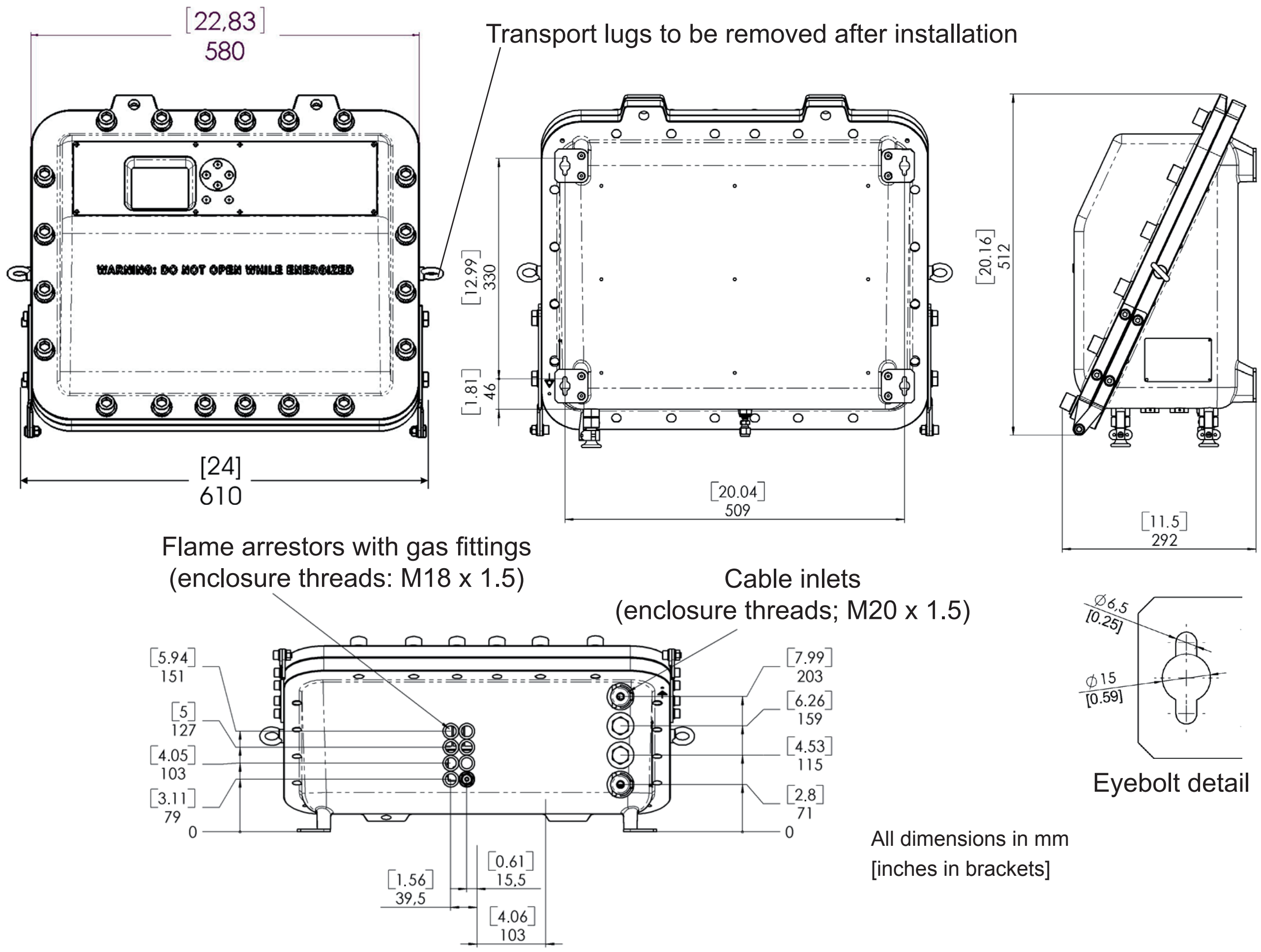


Fig. 2-12: X-STREAM X2FD - Dimensions

Housing

Max. operational ambient temperature range*)	-20 °C to +50 °C (-4 °F to 122 °F)
Max. ambient temperature range for storage	-20 °C to +70 °C (-4 °F to 158 °F)
Weight:	max. approx. 63 kg (138.6 lb) (dependent on configuration)
Protection class:	IP 66 (EN 60529) / NEMA 4X for outdoor use to be protected against direct sunlight
Gas connections:	quantity: max. 8 specification: flame arresters w. fittings connections: 6/4 mm or ¼“, stainless steel

**): Limitations apply to selected measurement principles and ranges,*
☞ Measurement specifications!

Technical data

2

2.2.4 Model-Specific Technical Data: X-STREAM X2FD

Power supply

Nominal input voltage	100–240 V∿ 50/60 Hz, global power supply unit
Input voltage range	85–264 V∿, 47–63 Hz
Nominal input current	
standard	1.3–0.7 A max.
with temperature control	3–1.5 A max.
	Connection via touch proof screw-type terminals located inside the unit near cable glands (Fig. 2-13).
Cable cross-section:	max. 4 mm^2 (10 AWG), end sleeves not required.
Cable entry via	1 cable gland, classified IP 68 or suitable conduit with metric-to-NPT adaptor
Permissible cable outer diameter:	3–13 mm (0.11–0.5 inch), dependent on inset used in cable gland

Power supply fuses

Fuse holders are integrated within power supply terminals.
Fuse ratings: AC 230 V / T 4 A / 5x20 mm

1 Power terminals with integrated fuse holders
2 Protective earth terminal (PE)
3 Power cable entry
4 EMI power supply filter

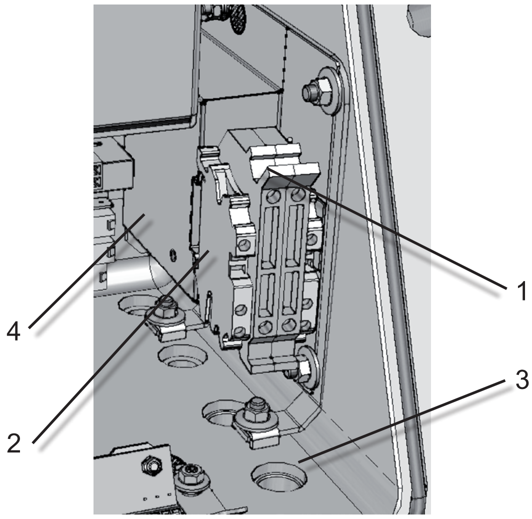


Fig. 2-13: X-STREAM X2FD - Power Supply Terminals / Fuse Holders

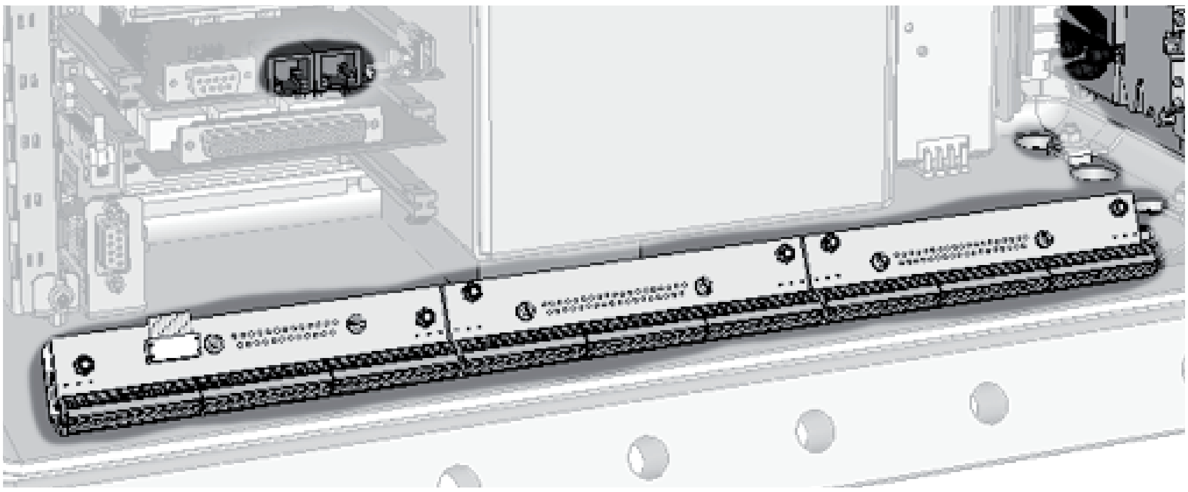
2.2.4 Model-Specific Technical Data: X-STREAM X2FD

Signal inputs and outputs

All signal cables are connected to internal screw-type terminals (Fig. 2-14), except the optional RJ45 ethernet connector.

Cable cross-section:	max. 1.5 mm², end sleeves not required.
Cable entry via	three IP 68 cable glands or conduits
Permissible cable outer diameter:	3–13 mm (0.11–0.5 inch), dependent on inset used in cable gland or conduit specification

Detailed terminal configuration ☞ separate model X-STREAM X2FD instruction manual addendum.



Note!
Depending on the actual analyzer configuration not all shown terminals may be installed!

Fig. 2-14: X-STREAM X2FD - Signal Terminals

2.3 Information on Name Plate

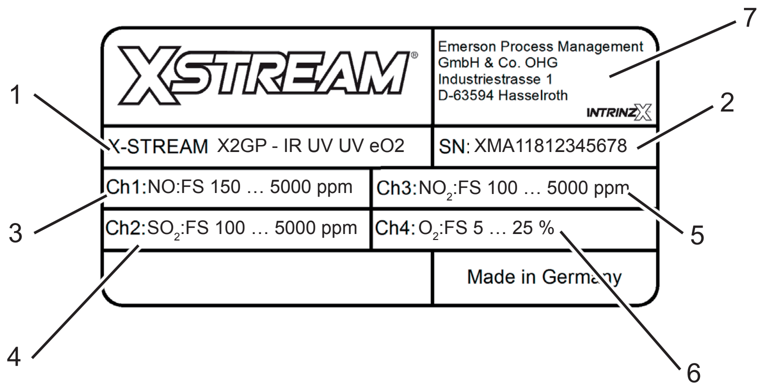
The name plate provides details on the configuration of the unit, installed measuring techniques, sample gases and measuring ranges. It also indicates the unit's serial number.

The plate is located on either the side or the rear of the unit.

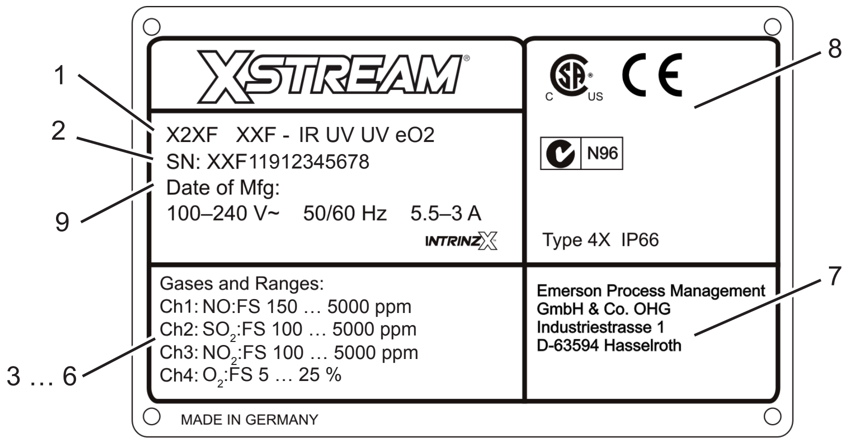
Note!

Analyzers configured to be installed in explosive areas have special name plates, described in the associated manuals.

X2GK, X2GP



Field housings



1 Model and installed measuring techniques (here: IR & 2x UV & electrochemical O_2)
2 Serial number
3 Channel 1: Gas and full scale ranges (here: NO, 150 to 5000 ppm)
4 Channel 2: Gas and full scale ranges (here:SO_2, 100 to 5000 ppm)
5 Channel 3: Gas and full scale ranges (here: NO_2, 100 to 5000 ppm)
6 Channel 4: Gas and full scale ranges (here:O_2, 5 to 25 %)
7 Manufacturer´s address
8 Certification marks (XEGK, XEGP: on a separate label)
9 Electrical data (XEGK, XEGP: on rear panel)

Fig. 2-15: Analyzer Name Plate (examples)

Chapter 3
Measuring Principles

X-STREAM series analyzers support several measuring principles depending on the gas component of interest. This provides best possible results, as the measurement can be chosen to optimally fit the characteristics of the gas to be measured with respect to the application. The following sections introduce the available measuring principles highlighting their specific characteristics.

3.1 Infrared Measurement (IR) Ultraviolet Measurement (UV)

The non-dispersive measurement methods described in this section utilize gas specific light absorption in order to discriminate between different gases. This is possible, as any gas possesses distinct absorption characteristics. Selective measurement of these so called absorption lines can be used to identify gas components: The amount of light absorpted by the absorption lines, is a direct measure of the gas concentration.

One can distinguish between two different types of non-dispersive measurements, differing in the way, wavelength selectivity is accomplished. It is essential for gas specific concentration measurements, to selectively detect only light of the absorption line wavelengths of the gas of interest. Typically a gas selective detector is used for NDIR measurements, ☞ 3-3. For NDUV the selectivity is achieved by an additional optical filter, as the detector itself is broadband sensitive. In some applications, a pyrodetector is used for NDIR measurements. This type of detectors is not wavelength selective, hence these setups also use an optical filter to narrow their wavelength response function.

The assembly of a NDIR and NDUV channel is shown in ☞ Fig. 3-3. For NDIR a broadband IR light source is used to generate the light, while NDUV measurements utilize a UV narrowband fluorescence source or an EDL (Electrodeless Discharge Lamp), already adopted for the absorption lines of the gas of interest. Part of this adoption is done by a specially selected optical filter in the adaptor cell.

The diameter of the light beam emitted from the sources is adjusted to completely fill the opening of the split analysis cell. After traversing the analysis cell, the light passes through a filter cell which adjusts the beam diameter to the chopper opening and the diameter of the active detector area. The chopper wheel used is designed to allow an intrinsically referenced measurement. The details of this new method are described in ☞ section 3.1.1.

The decision, which measurement (UV / IR) to be used for a specific application depends on the gas component to be measured, and the required measurement performance.

3.1.1 IntrinzX Technology

The IntrinzX technology is an enhancement of the well established “proof peak” technology with automatic sensitivity control, known from the MLT gas analyzer series. While the “proof peak” provided one reference measurement per chopper wheel revolution only, the IntrinzX technology provides four reference measurements per revolution. This IntrinzX technology has been introduced into the market with the launch of the X-STREAM X2 gas analyzers.

Using the new IntrinzX chopper wheel, the reference and the measurement signal are modulated with 4 and 5 times the basic revolution frequency. As a result, the proof peak

Measuring Principles

3

process is integrated into the measurement information, in contrast to being artificially inserted in the measurement signal.

Frequency filtering separates the sum signal into measurement and reference signal (☞ Fig. 3-1). This results in a permanently referenced signal by dividing the integrated reference level by the integrated measurement level for each revolution.

Therefore the IntrinzX technology provides many outstanding features:

- High dynamic measurement ranges (e.g. 0-200 to 50,000 ppm CO), which cannot be obtained with standard photometric technologies
- Reduced temperature dependency
- High sensitivity for lowest measuring ranges

This leads to cost saving effects for the customer:

- Fewer number of benches & cells
- Easier field repair and replacement of parts
- Easy adjustment of low measuring ranges in the field
- Reduced maintenance
- Extended span calibration intervals
- Minimized demand for test gases

Due to the inherent correlation between reference and measurement side, span calibration can often be achieved by zero calibration.

The above listed IntrinzX features offer a high degree of flexibility with regards to applications:

- One bench enables measurements of low & high ranges
- Low & high concentration in raw and clean gases
- Low and high ranges before and after scrubbers
- Measurement of carbon bed breakthrough / catalyst efficiency
- Mobile measurements at different sampling points / locations
- Easy adaption to different applications (universities, laboratories)
- Supports automotive engine testing
- Benches to be used in TOC applications for measurements of low and high carbon content

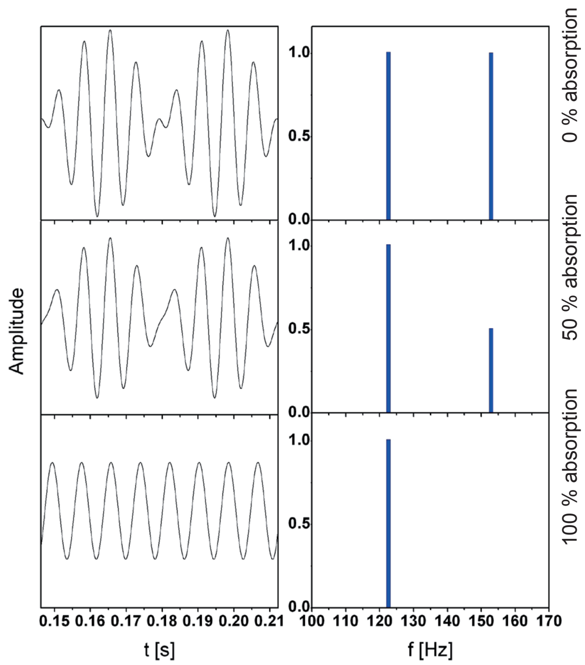


Fig. 3-1: IntrinzX signal forms

3.1.2 NDIR Detector

The standard detector used for NDIR measurements is an opto pneumatic detector. It consists of two chambers, filled with gas and connected via a small channel (☞ Fig. 3-2). The gas filling is chosen to provide maximum overlap with the gas to be measured. Usually the gas to be measured itself is used.

A micro flow sensor, placed in the connecting channel, measures the flow between both chambers. As light is absorbed by the gas in the absorption chamber, the gas temperature changes. This results in an increase of volume of the heated gas: The gas expands and flows towards the compensation chamber. When the chopper closes, no light is absorbed and thus temperature and volume of the gas in the absorption chamber decrease. Gas flows back from the (now) hotter compensation chamber into the absorption chamber. The absolute flow, detected by the micro flow sensor, in both cases is therefore a measure for the light absorbed while the chopper is open. This directly correlates to the amount of light not absorbed in the analysis cell and therefore to the concentration of the measurement gas inside the analysis cell.

Using the divided analysis cell and the IntrinzX chopper wheel, this enables simultaneous detection of measurement and reference signal.

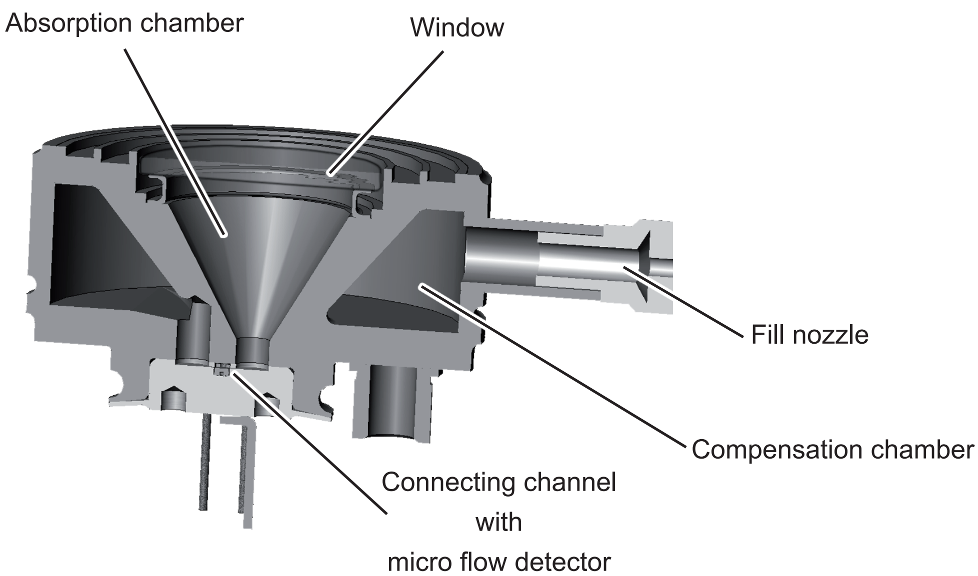


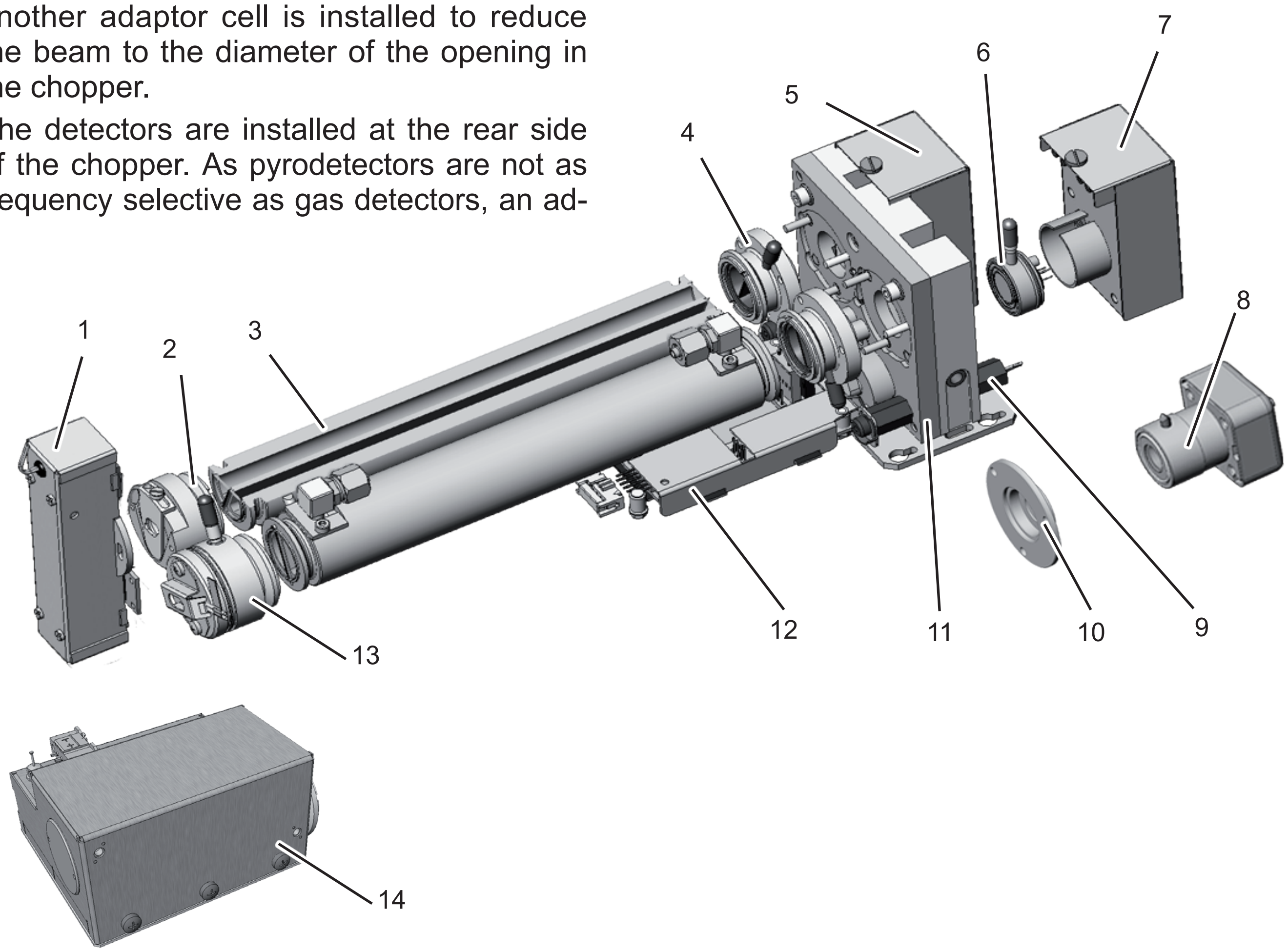
Fig. 3-2: Gas detector design principle

3.1 Infrared (IR) and Ultraviolet (UV) Measurement

3.1.3 Technical Implementation

The radiation emitted by an IR or UV/EDL source passes an adaptor cell, widening the beam to completely fill out the analysis cell´s diameter. At the opposite side of the cell, another adaptor cell is installed to reduce the beam to the diameter of the opening in the chopper.

The detectors are installed at the rear side of the chopper. As pyrodetectors are not as frequency selective as gas detectors, an additional filter has to be installed when using pyrodetectors, limiting the bandwidth of radiation passing the chopper.



1 UV source
2 Adaptor cell
3 Analysis cell (internal view)
4 Filter cell
5 UV detector
6 Gas detector
7 IR detector electronics
8 Pyro detector (alternatively)
9 Temperature sensor
10 Filter for pyro detector assembly
11 Chopper
12 Chopper electronics
13 IR source
14 EDL

Fig. 3-3: Photometer assembly principle

3.2 Oxygen Measurement

Two different principles are used for measuring oxygen concentrations. The currently used principle is given by the channel code (sample gas designator) on the nameplate label (☞ see figure on page 2-21):

pO2 = paramagnetical sensor

eO2 = electrochemical sensor

3.2.1 Paramagnetic Measurement

Oxygen measurement is based on the paramagnetical characteristics of oxygen molecules:

Two nitrogen filled quartz spheres (N_2 is not paramagnetic) are arranged in a dumbbell configuration and, hinged to a platinum wire, placed inside a cell. Fixed to the wire a small mirror reflects a light beam to a photo detector (fig. 3-7).

The measuring cell is placed inside an inhomogeneous magnetical field generated by a strong permanent magnet of specific design.

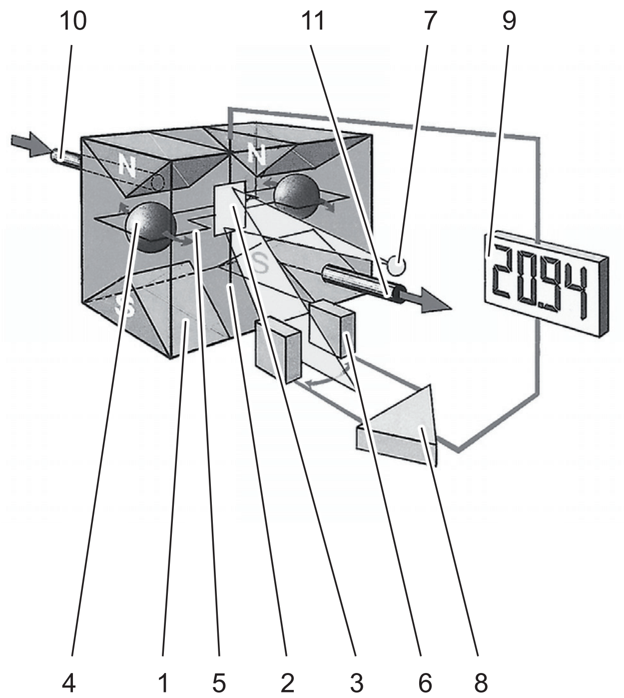
Oxygen molecules within the sample gas now due to their paramagnetical characteristics are deflected into the area of highest field strength. This generates different forces on both spheres and the resulting torque turns dumbbell and mirror out of the rest position. This generates a photodetector signal because the beam is deflected, too.

Initiated by the photodetector signal a preamplifier drives a compensation current through a loop surrounding the dumbbell to turn back the dumbbell into the rest position by effect of a magnetic field

So the current compensating the torque affec-ting the dumbbell is a direct measure for the oxygen concentration within the sample gas.

In addition to measuring cell, permanent magnet, electronics and enclosure the paramagnetic oxygen detector contains a temperature sensor and a heating element to hold the detector at approx. 55 °C.

Several variations are available including corrosion resistant, solvent resistant and/or intrinsically safe (for measuring flammable gases) versions.



1 Permanent magnet	6 Photodetector
2 Platinum wire	7 Light source
3 Mirror	8 Preamplifier
4 Glass ball	9 Display
5 Loop	10 Gas inlet
	11 Gas outlet

Fig. 3-4: Paramagnetic oxygen sensor - Assembly principle

3.2 Oxygen Measurement

Cross Interferences By Accompanying Gases

The Table below by selected gases shows, how accompanying gases interfere the paramagnetic oxygen measurement. A more comprehensive list of gases and their cross interferences for example is given in the standard IEC 61207-3.

If the concentration of such gases is already given at time of enquiry, this interference may be taken into account during factory startup and thus minimized (option)

100 % Gas		Zero-level effect % O_2
Acetylene	C_2H_2	-0.29
Ammonia	NH_3	-0.20
Argon	Ar	-0.25
Bromine	Br_2	-2.02
1.2-Butadiene	C_4H_6	-0.49
1.3-Butadiene	C_4H_6	-0.49
n-Butane	C_4H_{10}	-1.26
i-Butene	C_4H_8	-1.30
cis 2-Butene	C_4H_8	-0.89
trans 2-Butene	C_4H_8	-0.92
Carbon dioxide	CO_2	-0.30
Carbon monoxide	CO	+0.07
Chlorine	Cl_2	-0.94
Cyclohexane	C_6H_{12}	-1.84
Ethane	C_2H_6	-0.49
Ethylene	C_2H_4	-0.22
Helium	He	+0.33
n-Heptane	C_7H_{16}	-2.40
n-Hexane	C_6H_{14}	-2.02
Hydrogen	H_2	+0.26
Hydrogen bromide	HBr	-0.76

100 % Gas		Zero-level effect % O_2
Hydrogen chloride	HCl	-0.35
Hydrogen flouride	HF	+0.10
Hydrogen iodide	HI	-1.19
Hydrogen sulphide	H_2S	-0.44
Iodine	I	-2.40
Isobutane	C_4H_{10}	-1.30
Krypton	Kr	-0.55
Laughing gas	N_2O	-0.23
Methane	CH_4	-0.18
Neon	Ne	+0.17
Nitric acid	HNO_3	+0.43
Nitrogen	N_2	±0.00
Nitrogen dioxide	NO_2	+20.00
Nitrous oxide	NO	+42.94
n-Octane	C_8H_{18}	-2.78
n-Pentane	C_5H_{12}	-1.68
Oxygen	O_2	100
Propane	C_3H_8	-0.87
Propylene	C_3H_6	-0.64
Vinyl chloride	C_2H_3Cl	-0.77
Water	H_2O	-0.03
Xenon	Xe	-1.05

Note!
This data is based on a temperature of 60 °C (140 °F).

Tab. 3-1: Paramagnetic sensor - cross interferences (examples)

3.2 Oxygen Measurement

Applications With Corrosive Or Solvent Components

Special paramagnetic oxygen sensors are available to measure gases, containing corrosive or solvent components.

See below tables for further information on approved solvents, and medium affected materials.

Approved solvents (inclusive accompanying disturbing components)	
Acetic acid	Heptane
Acetone	Hexane
Acrolein	Isopropanol
Aromatics	Methanol
Butadiene	Methyl acetate
Butadiene-1	Methylethylketone
Butadiene-2	Methylmercaptane
C2H2	Propadiene
C4H8	Propene
C5	Propylen oxide
C6H12	Propylene
CH3COOH	Toluene
Cyclohexane	Vinyl acetate
Cyclohexanon	Vinyl acetylene
Dimethyl sulfide	Xylene
Ethanol	i-Butyr acid
Ethene	i-Butyr aldehyd
Ethylene	i-Propylformiat
Ethylene oxid	n-Butane

Conditions

- Single or summarized concentrations **do not exceed 20 %**
- Gas passes gas cooler prior to entering the analyzer
- Gas dew point at max. 5 °C

Solvent resistant sensors have limited lifetime and are consumables!

Tab. 3-2: Solvent resistant paramagnetic sensor - approved solvents

Component	**Measuring cell type**	
	Solvent resistant	**Corrosion resistant (Chlorine, dry)**
Case	SS 1.4572	SS 1.4573
Pole nucleus	Tantalum	
Mirror	Glass, Rhodium	
Tension band	Platinum alloy	
Loop wire	Platinum alloy	
Supporting wire	Platinum alloy	
Cylinder	Glass	
Cylinder bushing	Ceramics	
Dumbbell	Glass	
Taring	Epoxy	Epoxy
Compound material	Plumb bob, Epoxy	Epoxy
Seals	Kalrez	Kalrez

Tab. 3-3: Solvent resistant paramagnetic sensor - medium affected materials

Another variation of measuring cell has the following materials in contact with the sample:

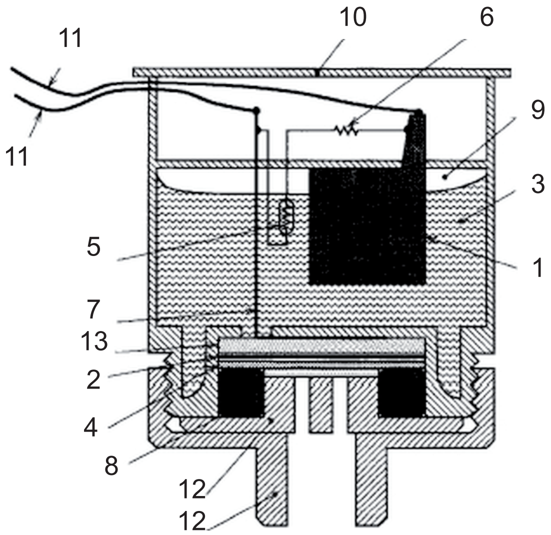
A316 stainless steel, viton ‘O’ ring, borosilicate glass, electroless nickel, platinum, platinum/iridium alloy.

For the solvent resistant version of this cell, the ‘O’ ring made of viton is replaced by a chemraz® model.

3.2.2 Electrochemical Measurement

This sensor utilizes the principle of galvanic cells, fig. 3-5 shows the design.

For storage and handling instructions, and safety data ☞ Chapter 7 "Maintenance".



1 Anode (lead)
2 Kathode (Gold)
3 Electrolyte solution
4 Membrane
5 Thermistor
6 Resistance
7 Titanum wire
8 O-Ring
9 Pressure compensating volumes
10 Lid
11 Electrical connections
12 Lids
13 Current collector

Fig. 3-5: Electrochemical Sensor Internal Assembly Principle

The electrochemical oxygen sensor‘s key components are a lead anode (1) and a gold cathode (2) surrounded by a special acid electrolyte (3).

The gold electrode is integrated solid with the membrane,which is a non-porous fluororesin membrane. Oxygen which barely diffuses through the membrane is electrochemically reduced on the gold electrode.

The temperature compensating thermistor and adjusting resistance are connected between the cathode and anode. The current generated by oxygen reduction is converted into a voltage by these resistances.

The value of the current flowing to the thermistor and resistance varies in proportion to the oxygen concentration of the measuring gases which contact the membrane. Therefore, the voltage at the terminal of the resistances is used for the sensor output to measure the oxygen concentration.

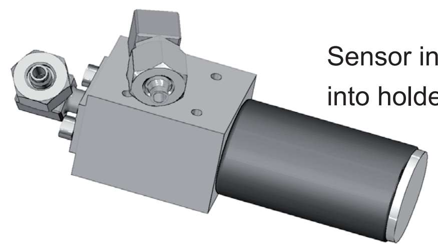


Fig. 3-6: Electrochemical O_2 Sensor - assembly

3.2 Oxygen Measurement

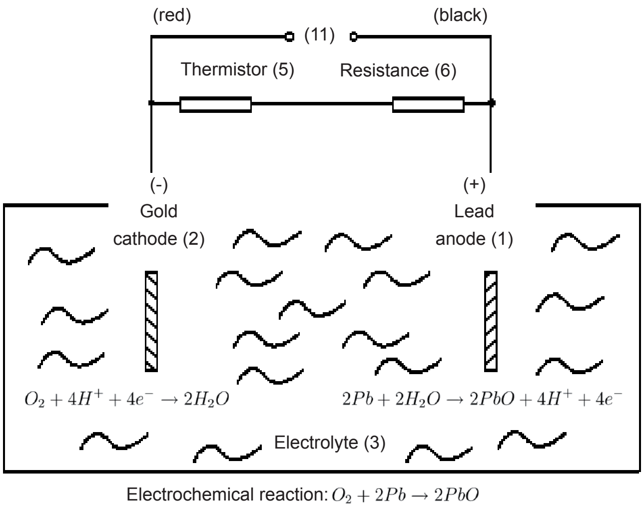


Fig. 3-7: Electrochemical reaction of Oxygen Sensor

In consequence of its design the sensor‘s lifetime is limited and depends on theoretical designed life and oxygen concentration. The sensor output can be taken as a rough criterion for end of lifetime: The sensor is weared when the output in atmosphere is below 70 % of the initial output. The period till this can be calculated by

$$\text{Lifetime} = \frac{\text{designed life (\% hours)}}{O_2 \text{ concentration (\%)}}$$

The sensor‘s designed lifetime under constant conditions of ambient temperature 20 °C is approx. **900,000 % hrs.**

The lifetime at 21 % oxygen is then calculated to approx. **42,857 hrs, corresponding to approx. 5 years.**

An indicator for end of lifetime is a reduced output signal. In this case the sensor must be replaced to ensure accurate measurements (☞ Chapter 7 "Maintenance").

Note!

The given values are for reference only! The expected lifetime is greatly affected by the temperature of the environment in which the sensor is used or stored (operation at 40 °C halves lifetime).

Increases or decreases in atmospheric pressure have the same effect as increasing or decreasing oxygen concentrations.

3.2.2.1 Special Hints

Due to the measuring principle the electrochemical oxygen cell requires a minimum internal consumption of oxygen (residual humidity avoids drying of the cell). Supplying cells continuously with dry sample gas of low grade oxygen concentration or with sample gas free of oxygen could result in a reversible detuning of O_2 sensitivity. The output signal will become unstable, but response time remains constant.

For correct measurement the cell needs continuously to be supplied with concentrations of at least 0.1 Vol.-% O_2 . We recommend to use the cells if need be in alternating mode, means to purge cells with conditioned (not dried, but dust removed) ambient air when measurement pauses.

If it is necessary to interrupt oxygen supply for several hours or days, the cell has to regenerate (supply cell for about one day with ambient air). Temporary flushing with nitrogen (N_2) for less than 1 h (e.g. for analyzer zeroing purpose) has no influence on measuring characteristics.This sensor is not suitable for anorganic gases containing chlorene or flourene!

In addition it is not suitable for sample gases containing ozone, H_2S (> 100 ppm) or NH_3 (> 20 ppm).

For a number of other interfering gases see Tab. 3-4.

Gas		**Concentration**	**Interference Level**
Carbon monoxide	CO	0-100 %	no effect
Carbon dioxide	CO_2	0-100 %	no effect
Nitric monoxide	NO	0-1 %	no effect
Nitrogen dioxide	NO_2	0-1 %	no effect
Sulfur dioxide	SO_2	0-3 %	3 %
Hydrogen sulfide	H_2S	0-3 %	no effect
Ammonia	NH_3	0-3 %	1 %
Hydrogen	H_2	0-100 %	no effect
Hydrogen chloride	HCl	0-3 %	1 %
Benzene	C_6H_6	0-100ppm	1 %
Methane	CH_4	0-100 %	no effect

Tab. 3-4: Electrochemical oxygen measurement - Cross interference by accompanying gases

Note for X2GP analyzers!
If the X2GP analyzer features a thermostate control, the eO2 sensor block is installed at the X2GP rear panel.

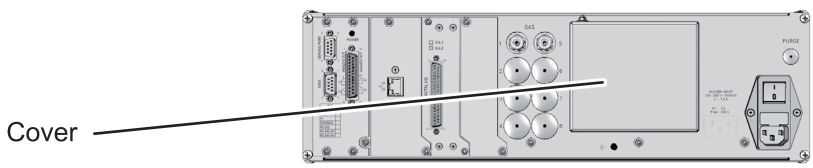


Fig. 3.8 Cover for eO2 sensor block at rear panel

3.2.3 Electrochemical Trace Oxygen Measurement

For trace oxygen measurements (tO_2)another electrochemical sensor technology is used, see Fig. 3-9. The sensor is a self contained disposable unit which requires no maintenance. The sensor utilizes the principle of electrochemical reaction to generate a signal proportional to the oxygen concentration in the sample.

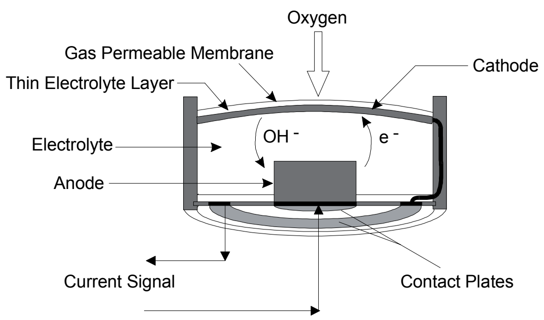


Fig. 3.9 Trace Oxygen sensor design principle

The sensor consists of a cathode and anode which are in contact via a suitable electrolyte. The sensor has a gas permeable membrane which covers the cathode allowing gas to pass into the sensor while preventing liquid electrolyte from leaking out.

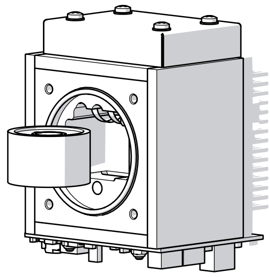
As the sample diffuses into the sensor, any oxygen present will dissolve in the electrolyte solution and migrate to the surface of the cathode. The oxygen is reduced at the cathode. Simultaneously, an oxidation reaction is occurring at the anode generating four electrons. These electrons flow to the cathode to reduce the oxygen.

The representative half cell reactions are:

anode: $4OH^- + 2Pb \rightarrow 2PbO + 2H_2O + 4e^-$

cathode: $4e^- + 2H_2O + O_2 \rightarrow 4OH^-$

in total: $2Pb + O_2 \rightarrow 2PbO$



This flow of electrons constitutes an electric current which is directly proportional to the concentration of oxygen present in the sample. In the absence of oxygen, no oxidation/reduction reaction occurs and therefore no current is generated. This allows the sensor to have an absolute zero.

3.2.3.1 Special Hints

This sensor is a consumable and requires replacement periodically. (To determine if the sensor requires replacement, see the troubleshooting section of this manual)

Remaining lifetime counts down when the sensor is in contact with oxygen.

For above reasons, the analyzer is shipped with the sensor as extra item in a sealed bag!

The sensor must be installed before analyzer startup, according the instructions shipped with the sensor!

Always consult the separate instructions, shipped with the sensor, before intending to start calibrations! Violation may result in a damaged sensor!

Prolonged exposure of the sensor to air can cause extended start up time, reduction of performance or damage to the sensor. Do not remove the sealing caps until all associated sample handling components are installed and the instrument is fully ready for installation.

After replacement purge gas paths with inert gas (nitrogen (N_2) or sample gas as soon as possible to avoid prolonged exposure of the sensor to high concentrations of oxygen. The longer the sensor is exposed to air, the longer it will take for the sensor to recover to low ppm levels. When installing a new sensor or starting the instrument for the first time, it may take as long as eight hours for the analyzer to purge down to the lowest operating range.

After initial startup or startup following a prolonged shutdown, the analyzer may require extended time to recover to the range of measurement. Commonly, this is caused by the introduction of ambient air into the sample and/or vent lines to the sensor. The presence of higher than normal levels of oxygen at the sensor will cause the sensor electrolyte to become saturated with dissolved oxygen. When the instrument is placed in operation, the sensor must now consume all excess dissolved oxygen above the desired measuring level.

All analyzers with electrochemical tO_2 cell have to be purged with inert gas (Nitrogen, N_2) prior to disconnecting the gas lines! Then the gas line fittings have to be closed for transport or depositing the analyzer.

While handling the sensor, always consider the documentation provided together with the sensor, especially the information on the included material (safety data) in the attachment of the documentation!

Note for X2GP analyzers!
If the X2GP analyzer features a thermostate control, the tO2 sensor block is installed at the X2GP rear panel.

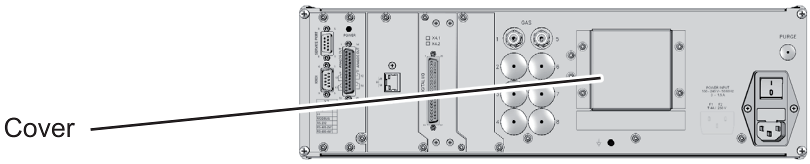


Fig. 3.10 Cover for tO2 sensor block at rear panel

3.3 Thermal Conductivity Measurement

Thermal conductivity is the property of a material that indicates its ability to conduct heat.

Thermal conductivity measurement primarily is used for measuring concentrations of hydrogen (H_2) and helium (He). These gases are characterized by a specific thermal conducitivity, differing clearly from that of other gases (☞ table 3-5).

Gas		λ in mW / cm K
		50 °C
Air	N_2/O_2	276
Ammonia	NH_3	270
Argon	Ar	189
Butane	C_4H_{10}	102
Carbon Dioxide	CO_2	184
Carbon Monoxide	CO	267
Chlorine	Cl_2	371
Helium	He	1580
Hydrochloric Acid	HCl	151
Hydrogen	H_2	1910
Krypton	Kr	185
Methane	CH_4	96,8
Neon	Ne	516
Nitrogen	N_2	277
Oxygen	O_2	283
Radon	Rn	26
Sulfur Dioxide	SO_2	113
Xenon	Xe	60

Tab. 3-5: Examples of specific thermal conductivities

3.3.1 Principle of Operation

A Wheatstone bridge, made of 4 temperature sensitive resistors (PT 100 sensors), is surrounded by gas in a way, that each 2 sensors are located in the sample gas stream (R_S) and in a reference gas stream (R_R), ☞ Fig. 3-11.

The bridge output signal (U_{Br}) is adjusted to zero when in rest position (no gas flow). By default the reference gas path is closed (not flown through by gas). When sample gas is supplied, the sensors in the sample gas path are cooled due to the thermal conductivity effect: The gas absorbs heat and carries it away from the sensors. This tunes the Wheatstone bridge and generates a signal proportional to the thermal conductivity.

Additional electronics linearizes and conditions this signal to provide usefull measuring values.Depending on application, it is possible to supply a reference gas to the bridge‘s reference side. The output signal in this case is proportional to the difference of the thermal conductivities of sample and reference gas.

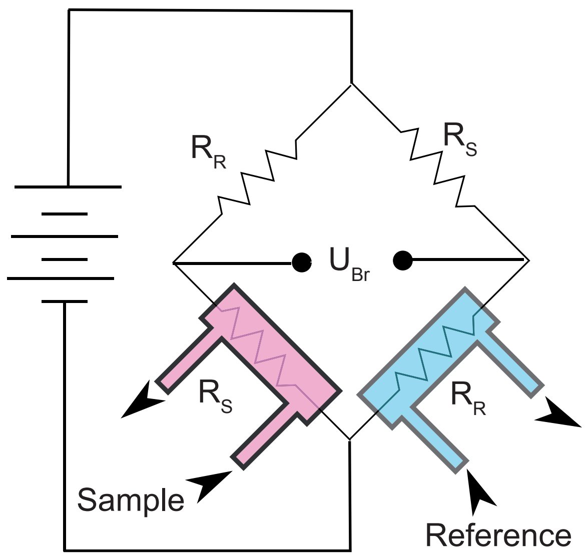
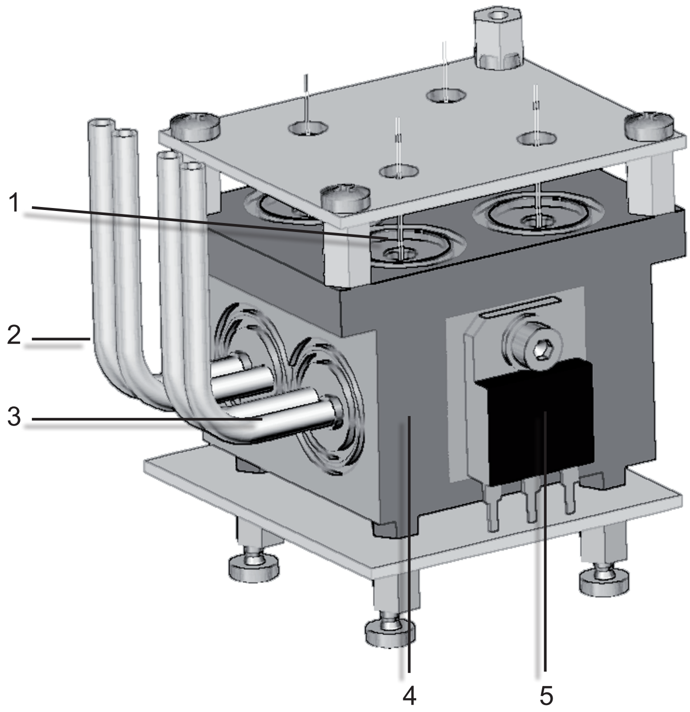


Fig. 3-11: Wheatstone Bridge

3.3.2 Technical Implementation

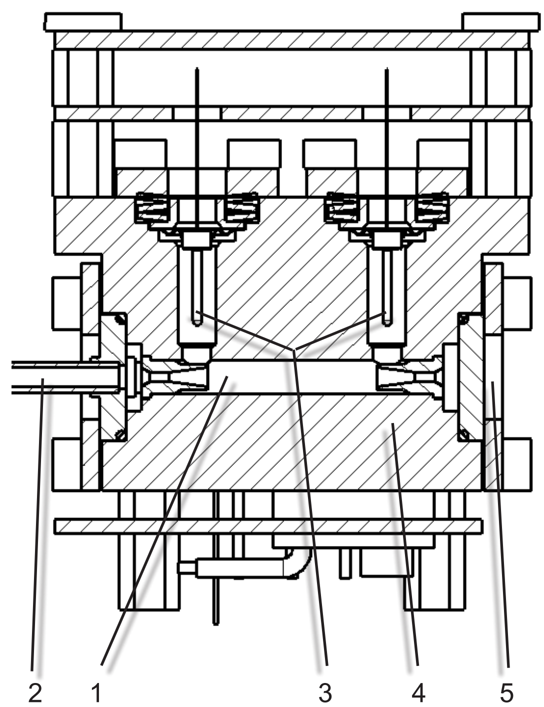
A block made either of aluminum, stainless steel or hastelloy contains two gas paths. Both, the volume of the block and the mass of the sensors have been minimized in order to obtain short response times. To suppress influences by changing ambient temperature the block is thermostatted and isolated against ambience.

The sensors are fully glass packaged to withstand aggressive gases.



1 Sensor
2 Sample gas inlet and output
3 Reference side inlet and output
4 Metal block
5 Heater for thermostatting

Fig. 3-12: TC cell, exterior view , thermal isolation removed



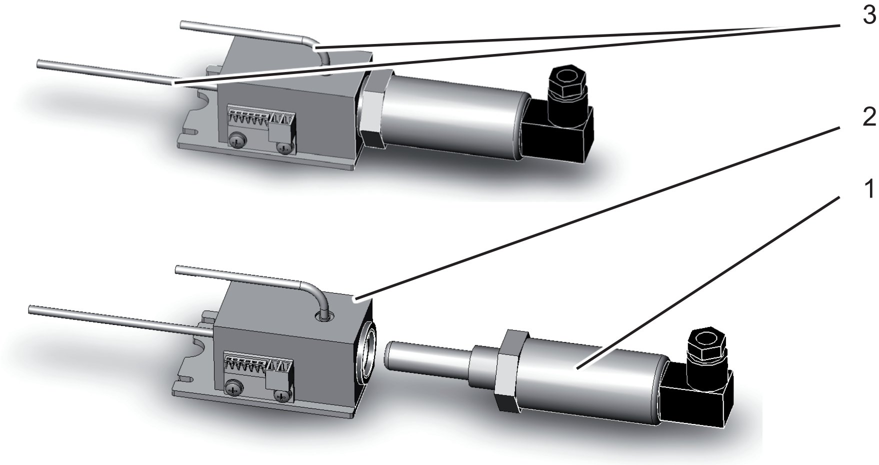
1 Internnal gas path
2 Sample gas inlet and output
3 PT 100 sensors
4 Metal block
5 Lid

Fig. 3-13: TC cell, sectional view

3.4 Trace Moisture Measurement

The Trace Moisture sensor is a robust 2-wire-transmitter, using dew point impedance measurement for continuous moisture measurements in gases and gas mixtures. It makes dew point measurement as accessible as temperature and pressure.

This type of sensor is used, if dew point measurements are required.



1 Sensor
2 Sensor block
3 Gas connections

Fig. 3-14: Trace Moisture Sensor Assembly

Some definitions:

The **dew point** is the temperature in Deg C to which a given parcel of humid air must be cooled, at constant barometric pressure, for water vapor to condense into water. The condensed water is called dew. The dew point is the saturation temperature.

The dew point is associated with **relative humidity.** A high relative humidity indicates that the dew point is closer to the current air temperature. Relative humidity of 100 % indicates the dew point is equal to the current temperature and the air is maximally saturated with water. If the dew point remains constant and temperature increases, relative humidity will decrease.

Humidity is the amount of water vapor in the air. Relative humidity is defined as the ratio of the partial pressure of water vapor (in a gaseous mixture of air and water vapor) to the saturated vapor pressure of water at a given temperature.

3.4 Trace Moisture Measurement

How does dew point measurement connect with trace moisture measurement?

The lower the dew point of a gas, the less is the content of moisture within that gas.

dp / °C	Water / ppm	dp / °C	Water / ppm
-100	0.025	-44	121
-98	0.038	-42	150
-96	0.057	-40	185
-94	0.084	-38	228
-92	0.123	-36	279
-90	0.179	-34	340
-88	0.258	-32	413
-86	0.368	-30	501
-84	0.520	-28	604
-82	0.729	-26	726
-80	1.01	-24	870
-78	1.40	-22	1039
-76	1.91	-20	1237
-74	2.59	-18	1468
-72	3.49	-16	1737
-70	4.68	-14	2048
-68	6.22	-12	2409
-66	8.22	-10	2826
-64	10.8	-8	3306
-62	14.1	-6	3856
-60	18.3	-4	4487
-58	23.5	-2	5208
-56	30.2	0	6030
-54	38.5	2	6964
-52	48.9	4	8025
-50	61.8	6	9226
-48	77.6	8	10 583
-46	97.1	10	12 113

Tab. 3-6: Dew Points and Water Content (at 1013 hPa)

3.4.1 Special Operating Conditions

The sensor is completely calibrated with all calibration data stored in its flash memory and does not require recalibration:

- If the sensor is included into a calibration procedure, it might end up with a wrong calibration and unusable sensor. Therefore the analyzer's trace moisture measurement channel is configured to be excluded from autocalibration procedures, by default calibrating all channels. This exclusion is done by factory setup and cannot be changed.
- For proper measurement results we recommend to exchange the sensor regularly after 12 months of operation.

3.4.2 Accompanying Gases

Several gases may affect the sensor, so consider the following limits:

Component		Maximum Permitted Concentration / ppm	Maximum Permitted Dew-point / °C
Acetylene (Ethyne)	C_2H_2	[1]	-20
Ammonia	NH_3	1000	-20
Aromatic alcohols		no limit	no limit
Benzene	C_6H_6	no limit	no limit
Bromine	Br_2	no limit	-20
Carbon dioxide	CO_2	no limit	no limit
Carbon disulphide	CS_2	no limit	no limit
Carbon monoxide	CO	no limit	no limit
Carbon tetrachloride	CCl_4	no limit	no limit
Carbon tetrafluoride	CF_4	no limit	-20
Chlorine	Cl_2	not permitted	–
Dichlorodifluoromethane	CCl_2F_2	no limit	-20
Ethane	C_2H_6	no limit	no limit
Ethylene (Ethene)	C_2H_4	no limit	no limit
Ethylene oxide	CH_4O	not permitted	–
Exhaust gases		no limit	no limit
Fluorine	F_2	10	-20
Glycol (Ethane-1,2-diol)	$HOCH_2CH_2OH$	no limit	no limit
Halogenated hydrocarbons		Consult with Emerson	
Hydrobromic acid	HBr	not permitted	–
Hydrochloric acid	HCl	not permitted [2]	–
Hydrofluoric acid	HF	500	-20
Hydrogen peroxide	H_2O_2	not permitted	–
Hydrogen sulphide	H_2S	no limit [3]	no limit
Mercury	Hg	not permitted [4]	-
Methane	CH_4	no limit	no limit
Methanoic acid	HCOOH	not permitted	–
Methanol	CH_3OH	[5]	no limit
Methylethyl glycol	$C_4H_{11}O$	no limit	no limit
Natural gas		no limit	no limit
Nitric acid	HNO_3	10	-20
Nitrogen dioxide	NO_2	no limit	-20
Nitrous oxide	N_2O	no limit	-20

Tab. 3-7: Limitations on Gases (I)

3.4 Trace Moisture Measurement

Component		Maximum Permitted Concentration / ppm	Maximum Permitted Dew-point / °C
Oxygen	O_2	no limit	no limit
Ozone	O_3	not permitted	–
Perchloric acid	$HClO_4$	not permitted	–
Phosgene	$COCl_2$	no limit	-20
Propane	C_3H_8	no limit	no limit
Sodium hydroxide	NaOH	not permitted	–
Sulphur dioxide	SO_2	no limit [6]	no limit
Sulphur hexafluoride	SF_6	no limit	no limit
Sulphur trioxide	SO_3	no limit	-20
Sulphuric acid	H_2SO_4	10	-20
Toluene	$C_6H_5CH_3$	no limit	no limit
Xylene	C_8H_{10}	no limit	no limit

1 Recommended sensor exchange after 6 months.

2 For refinery catalytic reformer applications, consult with EMERSON.

3 Consult with EMERSON for extremely sour natural gas, >1 % H_2S

4 Consider sacrificial gold filter to remove mercury vapour – Consult with EMERSON.

5 Consult with EMERSON - for impedance type sensors, recommended concentration limit of Methanol <10% of moisture concentration to be measured to ensure negligible interference effects.

6 At temperatures exceeding 50 °C (122 °F), the maximum concentration is 50 ppm.

The sensor should also be resistant to most organic acids, alcohols, ketones, aldehydes, esters and halogenated hydrocarbons, but will not be resistant to very strong alkalis. If in doubt, consult with EMERSON.

Tab. 3-7: *Limitation on Gases (II)*

3.5 Measurement Specifications

Sample gas components and measuring ranges (standard configurations)

In total, more than 60 gases are detectable, so the following table gives an overview only. Consult with Emerson for gases / configurations not listed.
Not all data is applicable to all analyzer variations. The sample gas(es) and measuring ranges for your specific analyzer are given by the order acknowledgement and on the analyzer's name plate label.

Gas component		Principle	Special Specs or Conditions	Standard Specs (see Tab. 3-9 – 3-11)	
			Lowest Range	Lowest Range	Highest Range
Acetone [1]	CH_3COCH_3	UV		0–400 ppm	0–3 %
Acetone [1]	CH_3COCH_3	IR		0–500 ppm	0–3 %
Acetylene	C_2H_2	IR		0–3 %	0–100 %
Ammonia	NH_3	IR		0–100 ppm	0–100 %
Argon	Ar	TCD		0–50 %	0–100 %
Carbon dioxide	CO_2	IR	0–5 ppm [5]	0–50 ppm	0–100 %
Carbon monoxide	CO	IR	0–10 ppm [5]	0–50 ppm	0–100 %
Chlorine	Cl_2	UV		0–300 ppm	0–100 %
Ethane	C_2H_6	IR		0–1000 ppm	0–100 %
Ethanol [1]	C_2H_5OH	IR		0–1000 ppm	0–10 %
Ethylene	C_2H_4	IR		0–400 ppm	0–100 %
Helium	He	TCD		0–10 %	0–100 %
Hexane [1]	C_6H_{14}	IR		0–100 ppm	0–10 %
Hydrogen [4]	H_2	TCD		0–1 %	0–100 %
Hydrogen Sulfide	H_2S	UV		0–2 %	0–10 %
Hydrogen Sulfide	H_2S	IR		0–10 %	0–100 %
Methane	CH_4	IR		0–100 ppm	0–100 %
Methanol [1]	CH_3OH	IR		0–1000 ppm	0–10 %
n–Butane	C_4H_{10}	IR		0–800 ppm	0–100 %
Nitrogen dioxide [1]	NO_2	UV	0–25 ppm [3]	0–50 ppm	0–10 %
Nitrogen monoxide	NO	IR		0–100 ppm	0–100 %
Nitrous oxide	N_2O	IR		0–100 ppm	0–100 %
Oxygen	O_2	electrochem.		0–5 %	0–25 % [2]
Oxygen	O_2	paramagn.		0–1 %	0–100 %
Oxygen, Trace	O_2	electrochem.		0–10 ppm	0–10 000 ppm
Propane	C_3H_8	IR		0–1000 ppm	0–100 %
Propylene	C_3H_6	IR		0–400 ppm	0–100 %
Sulfur dioxide	SO_2	UV	0–25 ppm [3]	0–50 ppm	0–1 %
Sulfur dioxide	SO_2	IR		0–1 %	0–100 %
Sulfur hexafluoride	SF_6	IR	0–5 ppm [3]	0–20 ppm	0–2 %
Toluene [1]	C_7H_8	UV		0–300 ppm	0–5 %
Vinyl chloride	C_2H_3Cl	IR		0–1000 ppm	0–2 %
Water vapor [1]	H_2O	IR		0–1000 ppm	0–8 %
Water vapor, Trace [1]	H_2O	capacitive		0–100 ppm	0–3000 ppm

[1] Dew point below ambient temperature
[2] Higher concentrations decrease sensor lifetime
[3] Daily zero calibration required for ranges below lowest standard spec range
[4] Special "refinery" application with 0–1% H_2 in N_2 available
[5] see Tab. 3-12

Tab. 3-8: Gas Components and Measuring Ranges, Examples

3.5 Measurement Specifications

Measurement Performance Specifications

	NDIR/UV/VIS	Thermal Conductivity (TCD)
Detection limit (4 σ) [1,4]	≤ 1 %	≤ 1 %
Linearity [1,4]	≤ 1 %	≤ 1 %
Zero-point drift [1,4]	≤ 2 % per week	≤ 2 % per week
Span (sensitivity) drift [1,4]	≤ 0.5 % per week	≤ 1 % per week
Repeatability [1,4]	≤ 1 %	≤ 1 %
Response time (t_{90}) [3]	4 s ≤ t_{90} ≤ 7 s [5]	15 s ≤ t_{90} ≤ 30 s [6]
Permissible gas flow	0.2–1.5 l/min.	0.2–1.5 l/min. (± 0.1 l/min)
Influence of gas flow [1,4]	≤ 0.5 %	≤ 1 % [11]
Maximum gas pressure [8,14]	≤ 1500 hPa abs. (≤ 7 psig)	≤ 1500 hPa abs. (≤ 7 psig)
Influence of pressure [2]		
– At constant temperature	≤ 0.10 % per hPa	≤ 0.10 % per hPa
– With pressure compensation [7]	≤ 0.01 % per hPa	≤ 0.01 % per hPa
Permissible ambient temperature [9]	0 (-20) to +50 °C (32 (-4) to 122 °F)	0 (-20) to +50 °C (32 (-4) to 122 °F)
Influence of temperature [1,13] (at constant pressure)		
– On zero point	≤ 1 % per 10 K	≤ 1 % per 10 K
– On span (sensitivity)	≤ 5 % (0 to +50 °C / 32 to 122 °F)	≤ 1 % per 10 K
Thermostat control [6,12]	none / 60 °C (140 °F) [5]	none / 60 °C (140 °F) [10]
Warm-up time [6]	15 to 50 minutes [5]	approx. 50 minutes

Note! *1 psi = 68.95 hPa*

1 Related to full scale
2 Related to measuring value
3 From gas analyzer inlet at gas flow of 1.0 l/min (electronic damping = 0 s)
4 Constant pressure and temperature
5 Dependent on integrated photometer bench
6 Depending on measuring range
7 Pressure sensor is required
8 Limited to atmospheric if internal sample pump
9 Temperatures below 0 °C (-4 °F) with thermostat control only
10 Thermost. controlled sensor: 75 °C (167 °F)
11 Flow variation within ± 0.1 l/min
12 Optional thermostatically controlled box with temperature 60 °C (140 °F), not X2GK
13 Temperature variation: ≤ 10 K per hour
14 Special conditions apply to model X2FD

Tab. 3-9: IR, UV, VIS, TCD - Measurement Performance Specifications

Important Notes Concerning Measurement Specification Data

The specifications given in these tables always apply to the physical measuring ranges, as listed e.g. in the INFO-RANGES.. menu (parameters „MinRange“ and „MaxRange“).

Scaling or zooming (☞ page 5-20) cannot improve analog output specifications to values better than specified by the physical measuring ranges

All performance data is verified during the manufacturing process for each unit by the following tests:

- Linearization and sensitivity test
- Long term drift stability test
- Climate chamber test
- Cross interference test (if applicable)

3.5 Measurement Specifications

	Oxygen Sensors		
	Paramagnetic (pO_2)	Electrochemical (eO_2)	Trace (tO_2)
Detection limit (4 σ) [1 4]	≤ 1 %	≤ 1 %	≤ 1 %
Linearity [1 4]	≤ 1 %	≤ 1 %	≤ 1 %
Zero-point drift [1 4]	≤ 2 % per week	≤ 2 % per week	≤ 1 % per week
Span (sensitivity) drift [1 4]	≤ 1 % per week	≤ 1 % per week	≤ 1 % per week
Repeatability [1 4]	≤ 1 %	≤ 1 %	≤ 1 %
Response time (t_{90}) [3]	< 5 s	approx. 12 s	20 to 80 s
Permissible gas flow	0.2–1.5 l/min	0.2–1.5 l/min.	0.2–1.5 l/min.
Influence of gas flow [1 4]	≤ 2 % [10]	≤ 2 %	≤ 2 %
Maximum gas pressure [7 14]	≤ 1500 hPa abs. (≤ 7 psig) [13]	≤ 1500 hPa abs. (≤ 7 psig)	≤ 1500 hPa abs. (≤ 7 psig)
Influence of pressure [2]			
– At constant temperature	≤ 0.10 % per hPa	≤ 0.10 % per hPa	≤ 0.10 % per hPa
– With pressure compensation [6]	≤ 0.01 % per hPa	≤ 0.01 % per hPa	≤ 0.01 % per hPa
Permissible ambient temperature [8]	0(-20) to +50 °C (32 (4) to 122 °F)	5 to +45 °C (41 to 113 °F)	5 to +45 °C (41 to 113 °F)
Influence of temperature [1 12] (at constant pressure)			
– On zero point	≤ 1 % per 10 K	≤ 1 % per 10 K	≤ 1 % per 10 K [5]
– On span (sensitivity)	≤ 1 % per 10 K	≤ 1 % per 10 K	≤ 1 % per 10 K [5]
Thermostat control	60 °C (140 °F) [11]	none	none [9]
Warm-up time	Approx. 50 minutes	-	Approx. 50 minutes

Note! *1 psi = 68.95 hPa*

[1] Related to full scale
[2] Related to measuring value
[3] From gas analyzer inlet at gas flow of 1.0 l/min (electronic damping = 0 s)
[4] Constant pressure and temperature
[5] Range 0–10…200 ppm: ≤ 5 % (5 to 45 °C / 41 to 113 °F)
[6] Pressure sensor is required
[7] Limited to atmospheric if internal sample pump
[8] Temperatures below 0 °C (-4 °F) with thermostat control only
[9] Thermost. controlled sensor: 35 °C (95 °F)
[10] For ranges 0–5…100 % **and** flow 0.5…1.5 l/min
[11] Optional thermostatically controlled sensor with temperature 60 °C (140 °F)
[12] Temperature variation: ≤ 10 K per hour
[13] No sudden pressure surge allowed
[14] Special conditions apply to model X2FD

Note! Take care of the tO_2 sensor‘s documentation, providing important calibration instructions!

Tab. 3-10: Oxygen - Standard Measurement Performance Specifications

Note 1!

Not all data listed are applicable to all analyzer versions (e.g. 60 °C thermostatically controlled box is not available for electrochemical and trace oxygen nor for ½19 in instruments).

Note 2!

For NDIR/UV/VIS measurements, take into account that

- *sample gas may diffuse or be released by leakages into the analyzer enclosure*
- *if existent in the analyzer surroundings, the component to be measured may enter the enclosure.*

Concentrations then may increase inside the enclosure. High concentrations of the component to be measured inside the enclosure may influence the measurement by unintended absorption, which could cause drift of the measurement.

A remedy for this issue is to purge the housing with gas not containing the component of interest.

3.5 Measurement Specifications

Trace Moisture (tH_2O)	
Measurement range	-100 to -10 °C dew point (0…100–3000 ppm)
Measurement accuracy	±2 °C dew point
Repeatability	0.5 °C dew point
Response time (t_{95})	5 min (dry to wet)
Operating humidity	0 to 100 % r.h.
Sensor operating temperature	-40 to +60 °C
Temperature coefficient	Temperature compensated across operating temperature range
Operating pressure	Depending on sequential measurement system, see analyzer specification [1] max. 1500 hPa abs / 7 psig [2]
Flow rate	Depending on sequential measurement system, see analyzer specification [1] 0.2 to 1.5 Nl/min

Note! *1 psi = 68.95 hPa*

[1] If installed in series to another measurement system, e. g. IR channel
[2] Special conditions apply to model X2FD

Note! Do not calibrate, see special calibration notes in the measurement description!

Tab. 3-11: Trace Moisture - Standard Measurement Performance Specifications

Special Performance Specifications for Gas Purity Measurements (ULCO & ULCO$_2$)

	0–10…< 50 ppm CO 0–5…< 50 ppm CO_2	
Detection limit (4 σ) [1 2]	< 2 %	
Linearity [1 2]	< 1 %	
Zero-point drift [1 2 3]	< 2 % *resp. < 0.2 ppm* [9]	
Span (sensitivity) drift [1 2 4]	< 2 % *resp. < 0.2 ppm* [9]	
Repeatability [1 2]	< 2 % *resp. < 0.2 ppm* [9]	
Response time (t_{90}) [7]	< 10 s	
Permissible gas flow	0.2–1.5 l/min.	
Influence of gas flow [1 2]	< 2%	
Maximum gas pressure [10 11]	≤ 1500 hPa abs. (≤ 7 psig)	
Influence of pressure [5]		
– At constant temperature	≤ 0.1 % per hPa	
– With pressure compensation [8]	≤ 0.01 % per hPa	
Permissible ambient temperature	+15 to +35 °C (59 to 95 °F)	+5 to +40 °C (41 to 104 °F)
Influence of temperature [6] (at constant pressure)		
– On zero point	< 2 % per 10 K *resp. < 0.2 ppm per 10 K* [9]	
– On span (sensitivity)	< 2 % per 10 K *resp. < 0.2 ppm per 10 K* [9]	
Thermostat control	none	60 °C (140 °F)

Note! *1 psi = 68.95 hPa*

[1] Related to full scale
[2] Constant pressure and temperature
[3] Within 24 h; daily zero calibration requested
[4] Within 24 h; daily span calibration recommended
[5] Related to measuring value
[6] Temperature variation: ≤ 10 K per hour
[7] From gas analyzer inlet at gas flow of 1.0 l/min
[8] Barometric pressure sensor is required
[9] Whichever value is higher
[10] Limited to atmospheric if internal sample pump
[11] Special conditions apply to model X2FD

Tab. 3-12: Special Performance Specifications for Gas Purity Measurements

Chapter 4
Installation

This chapter describes the correct installation procedure for the various X-STREAM analyzer versions.

On receipt, check the packaging and its contents thoroughly for damage.

Inform the carrier immediately of any damage to packaging or contents.

Store the instrument at a dry and clean place, considering the acceptable environmental conditions. We recommend to keep the packaging available for returning the instrument in case of failure, because only the original packaging ensures proper protection during transportation!

4.1 Scope of Supply

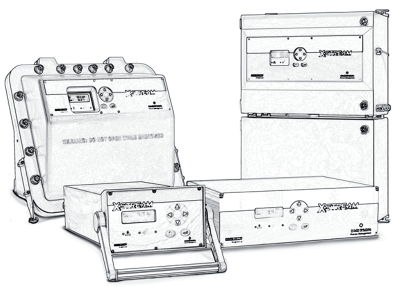
WARNING

HAZARDS FROM MISSING INFORMATION

Compare the contents of your package with the pictures below.

Analyzers for hazardous areas need additional parts, described in the accompanying documentation refering to hazardous area installations.

Call your local sales office if something is missing, and DO NOT continue to install your analyzer, until all parts are at hand!



Analyzer

Manuals, some of which either as paper or electronic version on USB stick:

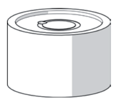
- short form manual for general purpose instruments
- X-STREAM X2 series manual

If applicable to your instrument

- special addendum manual for hazardous area installations
- infallible containment instruction manual

USB stick

external power supply unit with DC power cable (X2GK, option)



Trace oxygen cell (if applicable)

Fig. 4-1: X-STREAM X2 Analyzers - scope of supply

4.2 Introduction

WARNING

ELECTRICAL SHOCK HAZARD

Before connecting the analyzer to mains power, please read the chapter on safety warnings and the following instructions carefully.

The place of installation must be clean, dry and protected against strong vibrations and frost. Please observe the admissable operating temperatures given in the technical data.

Units must not be subjected to direct sunlight or sources of heat.

For outdoor installation it is recommended to install the unit in a cabinet. It should at least be protected against rainfall.

In order to comply with regulations on electromagnetic compatibility, it is recommended to use only shielded cables which can be supplied by Emerson Process Management. The customer must ensure that the shielding is correctly connected to the signal cable plug housing. Submin-d plugs and sockets must be screwed to the analyzer.

The use of external submin-d to screw-type terminal adapters affects electromagnetic compatibility. In such a case the customer must take appropriate measures to comply with the regulations, and must declare conformity when this is legally required (e.g. European EMC guidelines).

4.3 Gas Conditioning

In order to ensure trouble-free operation, special attention must be paid to the preparation of the gases:

All gases must be conditioned before supplying to the analyzer, to ensure they are

- **dry,**
- **free of dust and**
- **free of any aggressive components which may damage the gas lines (e.g. by corrosion or solvents) .**

Flammable gases must not be supplied without suitable protective measures.

Pressure and gas flow must remain within the values given in the ☞ „Measurement Specifications“ section within this manual.

If moisture cannot be avoided, it is necessary to ensure that the dew point of the gases is at least 10 °C (18 °F) below the ambient temperature to avoid condensate in the gas lines.

The X-STREAM field housings can optionally be fitted with heated piping to enable the use of gases with a maximum dew point of 25 °C (77 °F).

Hints for selected gases

- **Calibration gases for CO and NO** need to be moistured by supplying them via a cooler.

4.3 Installation - Gas Conditioning

Enclosure purge option

The purge medium (e.g. to minimize CO_2 interference or for enhanced safety while measuring corrosive or poisonous gases)

- **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.**

Its temperature must correspond to the ambient temperature of the analyzer, but be at least within the range 20…35 °C (68…95 °F).

For information about values for pressure and flow, please contact your nearest EMERSON Process Management sales office.

We recomment to always purge the analyzer enclosure, if gases are supplied, which may harm analyzer components, if due to a leak released into the analyzer enclosure!

Open reference option

In some cases, the measuring cell has an open reference side, to be supplied with nitrogen.

This nitrogen

- **at least should be of quality 5.0, which means nitrogen of purity ≥ 99.999 %.**

If such gas is not available, the substitute

- **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.**

In any case, the gas temperature must correspond to the ambient temperature of the analyzer, but at least be within the range 20…35 °C (68…95 °F).

Pressure and gas flow must remain within the values given in ☞ „Chapter 3 Measuring Principles“ within this manual.

Perform a calibration each time the source of this gas (e. g. bottle) has changed!

4.4 Gas Connections

WARNING

TOXIC GAS HAZARDS

Take care that all external gas pipes are connected in the described way and that they are gastight to avoid leakages!

Faulty connected gas pipes lead to explosion hazard or even to mortal danger!

Don‘t take a breath of the emissions! Emissions may contain hydrocarbons or other toxic components (e.g. carbon monoxide)! Carbon monoxide may cause headache, sickness, unconsciousness and death.

CAUTION

Do not confuse gas inlets and outlets. All gases supplied must be prepared beforehand. When supplying aggressive gases, ensure that the gas lines are not damaged.

Max. admissable pressure: 150 kPa / 7 psig; atmospheric with internal pump!

Exhaust lines must be installed to incline downwards and be unpressurized and protected against frost, and conform to legal requirements.

TRACE OXYGEN MEASUREMENTS

The sensor for trace oxygen measurements is a consumable.
Remaining lifetime counts down when the sensor is in contact with oxygen.

For above reasons, the analyzer is shipped with the sensor as extra item in a sealed bag! The sensor must be installed before analyzer startup, according the instructions shipped with the sensor!

Do not use plastic tubing for trace oxygen measurements as it can permeate oxygen from the ambient air and cause higher than expected oxygen readings.

4.4 Installation - Gas Connections

The number of gas connections and their configuration may vary according to analyzer version and installed options.

All gas connectors are labelled and can be found on the

- analyzer's rear panel (X-STREAM X2GP, X-STREAM X2GK)
- underside of the analyzer (X-STREAM field housings)

Should it be necessary to open the gas lines, the gas connectors should be sealed with PVC caps to prevent pollution by moisture, dust, etc.

	IN	OUT
1	SAMPLE	SAMPLE
2		
3		
4		PURGE GAS

Fig. 4-2: Labelling of gas connectors (example)

The analyzer should be mounted close to the sample gas source to minimize transport time. A sample gas pump can be used to reduce the reaction time; this requires that the analyzer be operated in bypass mode or fitted with a pressure control valve to protect against excessive gas flow and pressure (Fig. 4-3).

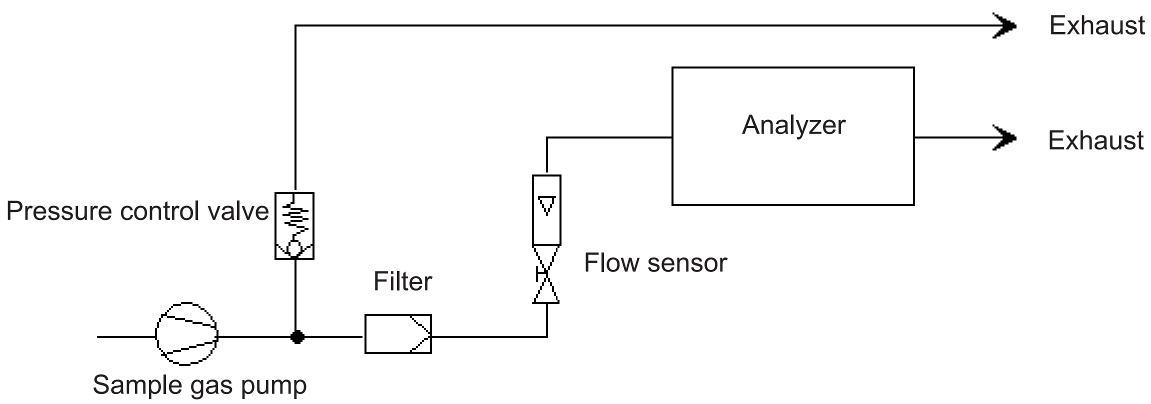


Fig. 4-3: Installation in bypass mode

4.5 Electrical Connections

WARNING

ELECTRICAL SHOCK HAZARD

Only qualified personnel, observing all applicable technical and legal requirements, may install these devices and connect power and signal cables.

Failure to comply may render the guarantee void and cause exposure to risk of damage, injury or death.

The devices may only be installed by personnel who are aware of the possible risks. Working on units with screw-type terminals for electrical connections may require exposure to energized components.

Wall-mounted X-STREAM analyzers are not fitted with power switches and are operational as soon as they are connected to a power supply.

For these analyzers a switch or circuit breaker (IEC 60947-1/-3) must be installed on the premises. The switch or breaker must be located near the analyzer, easily accessible and labelled as a power supply cut-off for the analyzer.

Units with screw-type terminals must be de-energized by unplugging it or operating the separate cut-off switch or circuit breaker when working on the power connections.

To avoid the risk of electrocution, all units must be earthed. For this reason, the power cable with a protective earth wire must be used.

Any break in the earth wire inside or outside the unit may cause exposure to the risk of electrocution and is therefore prohibited.

4.6 Analyzer Specific Instructions for Installation

Important note for X-STREAM X2FD!

*Due to the special conditions which must be observed when installing units in EX zones, the installation of the flameproof **X-STREAM X2FD** version is described in a separate **instruction manual HASXMDE-IM-EX**.*

Even if you do not install your X-STREAM X2FD in an EX zone, please install the unit according to the instructions in the separate manual.

Installation instructions:	X-STREAM X2GK	☞	page 4-8
	X-STREAM X2GP	☞	page 4-14
	X-STREAM X2XF Field housings	☞	page 4-22
Notes for wiring signal inputs and outputs		☞	page 4-33

4.6.1 X-STREAM X2GK

Plugs and sockets required for the electrical connections are on the rear panel of the unit (Fig. 4-5).

X-STREAM X2GK analyzers are powered by an internal wide range power supply for worldwide use, or by an external DC 24 V power supply unit, optionally supplied with the unit. If an external PSU is not included in delivery, another unit can be used instead, provided it conforms to the specifications in section 2.2.1.1 ☞ page 2-8.

X-STREAM X2GK analyzers should be operated in a horizontal position.

Six screws at the front panel enable to install X2GK models into a rack. The external PSU is optionally available for rack mounting, too.

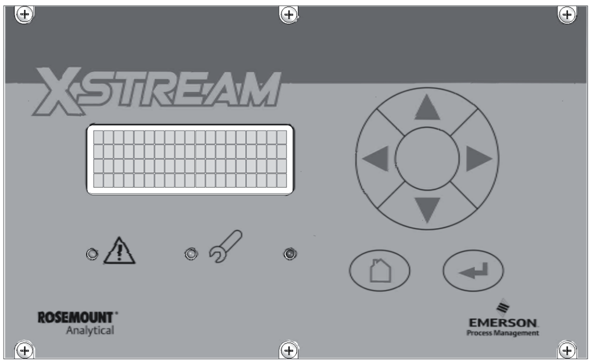


Fig. 4-4: X-STREAM X2GK - front panel

4.6.1 Installation - X-STREAM X2GK

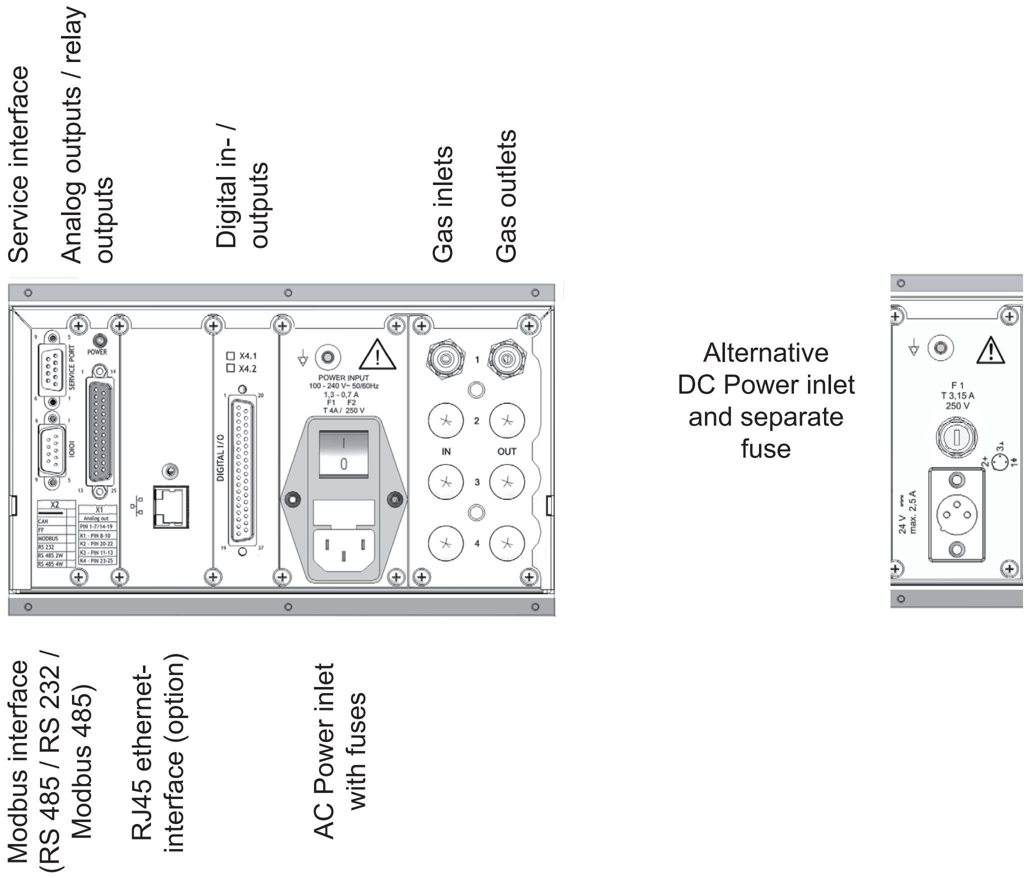


Fig. 4-5: X-STREAM X2GK - rear panel

The number and configuration of the gas inlets and outlets vary from model to model and are indicated on the notice on the rear of the instrument.

To simplify installation, we recommend labelling the gas lines as in Fig. 4-5 (1, 2, 3, ...). This avoids confusion in case the analyzer ever has to be disconnected.

Gas connections:	Quantity: of which optional	max. 8 1 or 2 as purge gas connections
	Material: optional	PVDF 6/4 mm Stainless steel 6/4 mm or ¼", others on request

4.6.1 Installation - X-STREAM X2GK

Signal inputs and outputs

The number of signal outputs actually available varies according to the unit's configuration.

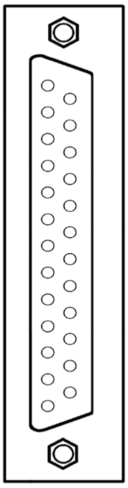
Analog signals
Relay outputs

Analog signals and relay outputs are on a shared 25-pin submin socket (X1; Fig. 4-6).

Specification of analog signal outputs:	4 (0)–20 mA; load: $R_B \leq 500\ \Omega$
Specification of relay outputs 1-4:	dry relay change-over ontacts, can be used as normally open (NO) or normally closed (NC)
Electrical specification:	max. 30 VDC, 1 A, 30 W

Note!
Consider the installation notes in section 4.5.

	Signal	Pin
Analog outputs	Channel 1, (+) 4 (0)–20 mA	1
Analog outputs	Channel 2, (+) 4 (0)–20 mA	2
Analog outputs	Channel 3, (+) 4 (0)–20 mA	3
Analog outputs	Channel 4, (+) 4 (0)–20 mA	4
Analog outputs	*unused*	5
	unused	6
	unused	7
Relay contacts (Status signals)	Output1 (Failure) NC	8
Relay contacts (Status signals)	Output1 (Failure) NO	9
Relay contacts (Status signals)	Output1 (Failure) COM	10
Relay contacts (Status signals)	Output3 (Off spec) NC	11
Relay contacts (Status signals)	Output3 (Off spec) NO	12
Relay contacts (Status signals)	Output3 (Off spec) COM	13



Pin	Signal	
14	Channel 1, GND	Analog outputs
15	Channel 2, GND	Analog outputs
16	Channel 3, GND	Analog outputs
17	Channel 4, GND	Analog outputs
18	unused	Analog outputs
19	*unused*	
20	Output2 (Maintenance request) NC	Relay contacts (Status signals)
21	Output2 (Maintenance request) NO	Relay contacts (Status signals)
22	Output2 (Maintenance request) COM	Relay contacts (Status signals)
23	Output4 (Function check) NC	Relay contacts (Status signals)
24	Output4 (Function check) NO	Relay contacts (Status signals)
25	Output4 (Function check) COM	Relay contacts (Status signals)

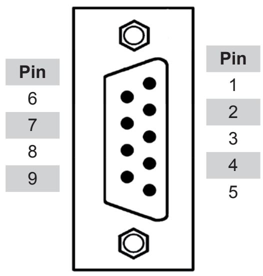
Note!
Configuration of relay contacts as per standard factory setting (NAMUR status signals)

Fig. 4-6: Socket X1 - Pin configuration

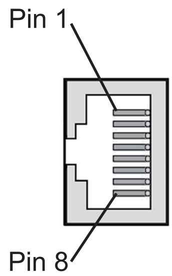
4.6.1 Installation - X-STREAM X2GK

Modbus interface

For specifications and notes on control, see ☞ chapter 7



Pin no.	MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
1	Common	Common	Common
2	*not used*	*not used*	RXD
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*	RXD0(-)	*not used*
9	D0(-)	TXD0(-)	*not used*



Pin no.	Signal
1	TX+
2	TX-
3	RX+
6	RX-
other	*not used*

Ethernet connector

Fig. 4-7: Plug X2 - Modbus interface

Notes!
Consider the installation notes in section 4.5.

X-STREAM analyzers are classified as DTE (Data Terminal Equipment).

4.6.1 Installation - X-STREAM X2GK

Digital inputs

Type: 7 inputs

Electrical specification: max. 30 V⎓, internally limited to 2.3 mA
H signal: min. 4 V;
L signal: max. 3 V
common ground (GND), electrically isolated from chassis earth connection

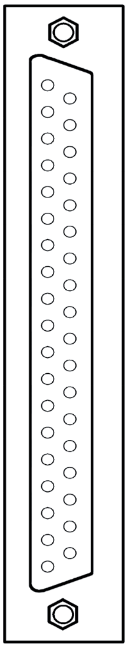
Digital outputs

Type: 9 outputs, dry relay change-over ontacts, can be used as normally open (NO) or normally closed (NC)

Electrical specification: max. 30 VDC, 1 A, 30 W

Note!
Consider the installation notes in section 4.5.

	Signal	Pin
Digital inputs	Input 1	1
	Input 2	2
	Input 3	3
	Input 4	4
	GND for all digital inputs	5
	unused	6
	unused	7
Digital outputs	Output 5 NC	8
	Output 5 NO	9
	Output 5 COM	10
	Output 6, NC	11
	Output 6, NO	12
	Output 6, COM	13
	Output 7, NC	14
	Output 7, NO	15
	Output 7, COM	16
	Output 8, NC	17
	Output 8, NO	18
	Output 8, COM	19



Pin	Signal	
20	Input 5	Digital inputs
21	Input 6	
22	Input 7	
23	Output 9, NC	Digital outputs
24	Output 9, NO	
25	Output 9, COM	
26	Output 10, NC	
27	Output 10, NO	
28	Output 10, COM	
29	Output 11, NC	
30	Output 11, NO	
31	Output 11, COM	
32	Output 12, NC	
33	Output 12, NO	
34	Output 12, COM	
35	Output 13, NC	
36	Output 13, NO	
37	Output 13, COM	

Note!
The configuration illustrated here is that of the first socket, labelled X4.1.
Inputs 8-14 and outputs 14-22, are on the second socket (X4.2), if installed.

Fig. 4-8: Socket X4 - Pin configuration

Installation
4

4.6.1 Installation - X-STREAM X2GK

Power supply

24 VDC is supplied to the unit by means of a three-pin XLR connector on the rear panel of the instrument.

Depending on the order, the following is supplied as an accessory: either

- an external power supply unit which can be connected directly to the analyzer using the supplied cable

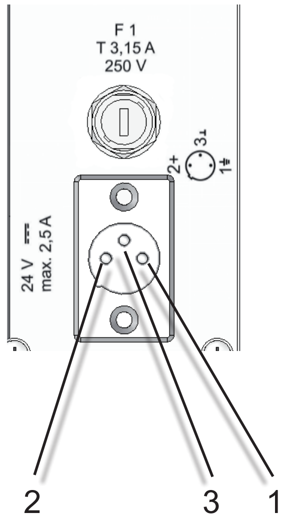
or

- a connector which can be used with a cable and PSU as specified by the customer.

Note the configuration of the pins on the connector (☞ Fig. 4-9, upper image).

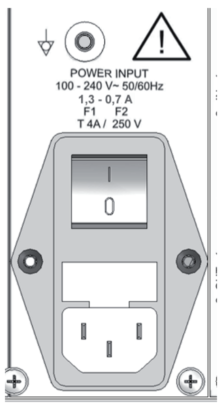
Details of any PSUs supplied with the unit are given in ☞ section 2.2.1.1, page 2-8ff.

AC power is supplied to the unit by means of a three-pin IEC connector on the rear panel of the instrument.



1: ME
2: + 24 V⎓
3: 0 V (⊥)

DC supply



AC supply

Fig. 4-9: Power In Connectors

4.6.2 X-STREAM X2GP

The brackets either side of the front panel enable the unit to be mounted in a rack; this is accomplished by means of four screws (Fig. 4-10).

X-STREAM X2GP analyzers should be operated in a horizontal position.

This model is fitted with plugs and sockets as standard for electrical connections. They are located at the rear of the instrument (Fig. 4-11).

Optionally, adapters are available which can be mounted on the signal connectors to enable signal cables to be connected using screw-type terminals (Fig. 4-12).

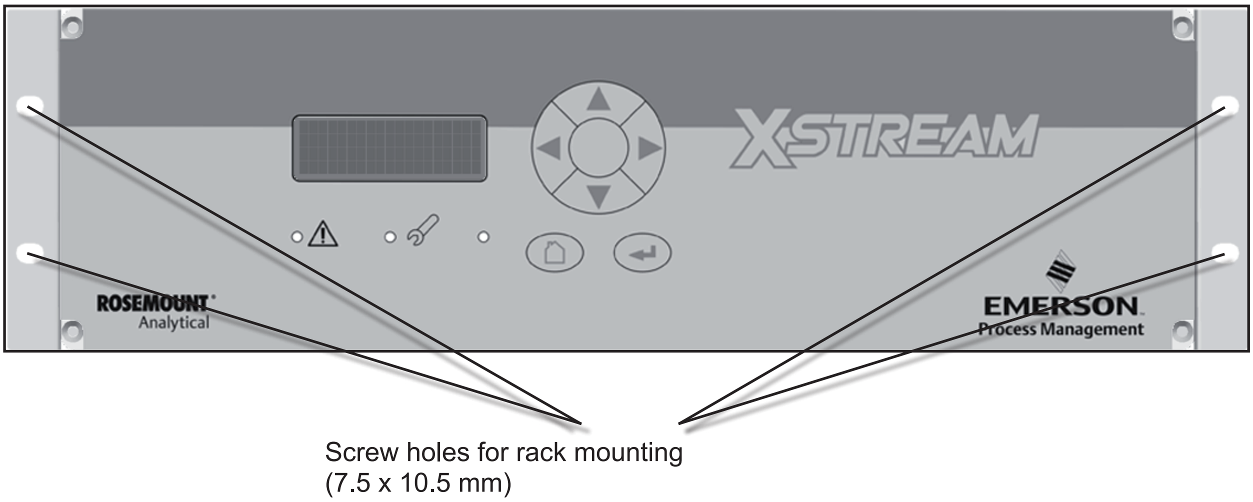


Fig. 4-10: X-STREAM X2GP - front view

4.6.2 Installation - X-STREAM X2GP

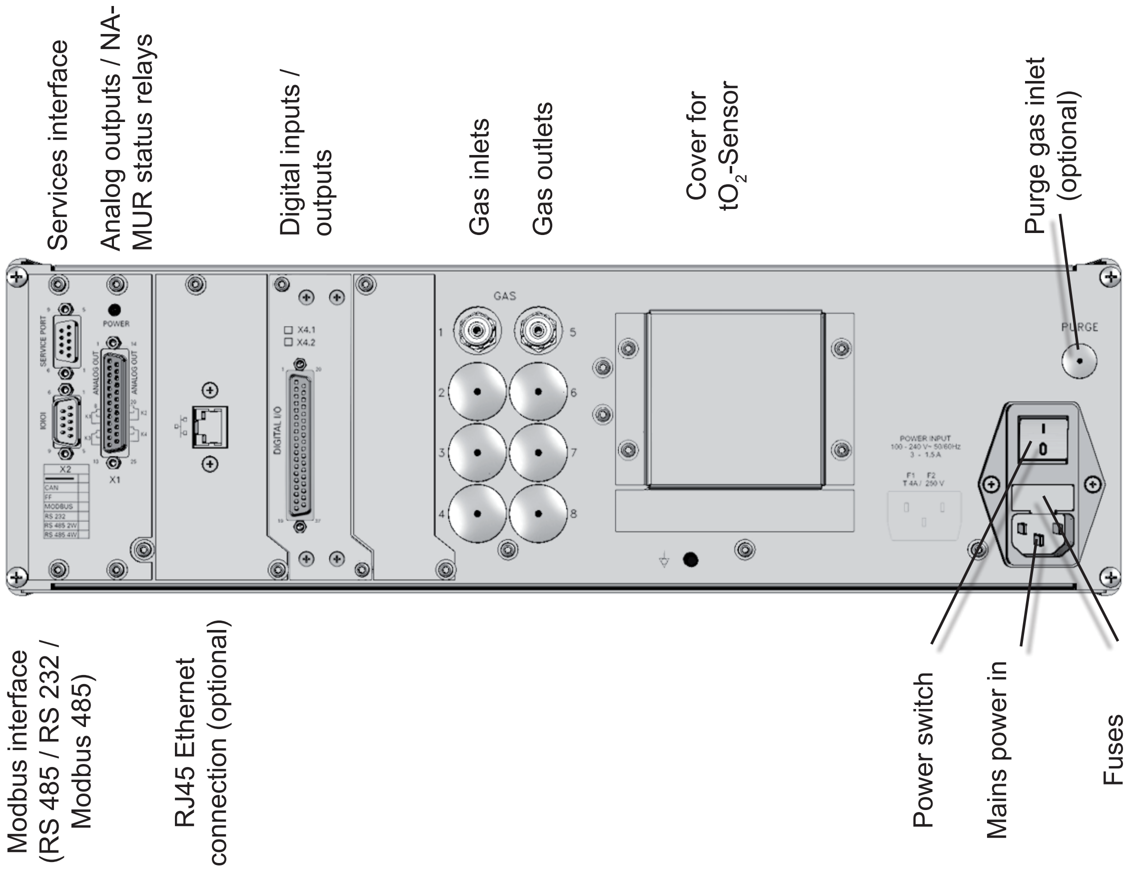


Fig. 4-11: X-STREAM X2GP - Rear panel, model with signal plugs and sockets

The number and configuration of the gas inlets and outlets vary from model to model and are indicated on the notice on the rear of the instrument.

To simplify installation, we recommend labelling the gas lines as in Fig. 4-11 (1, 2, 3, 4, ...). This avoids confusion in case the analyzer ever has to be disconnected.

Gas inlets and outlets

Quantity:		max. 8 (plus. 1 purge gas inlet (optional))
Specification:		6/4 mm PVDF
	optional	6/4 mm or ¼", stainless steel, others on request

4.6.2 Installation - X-STREAM X2GP

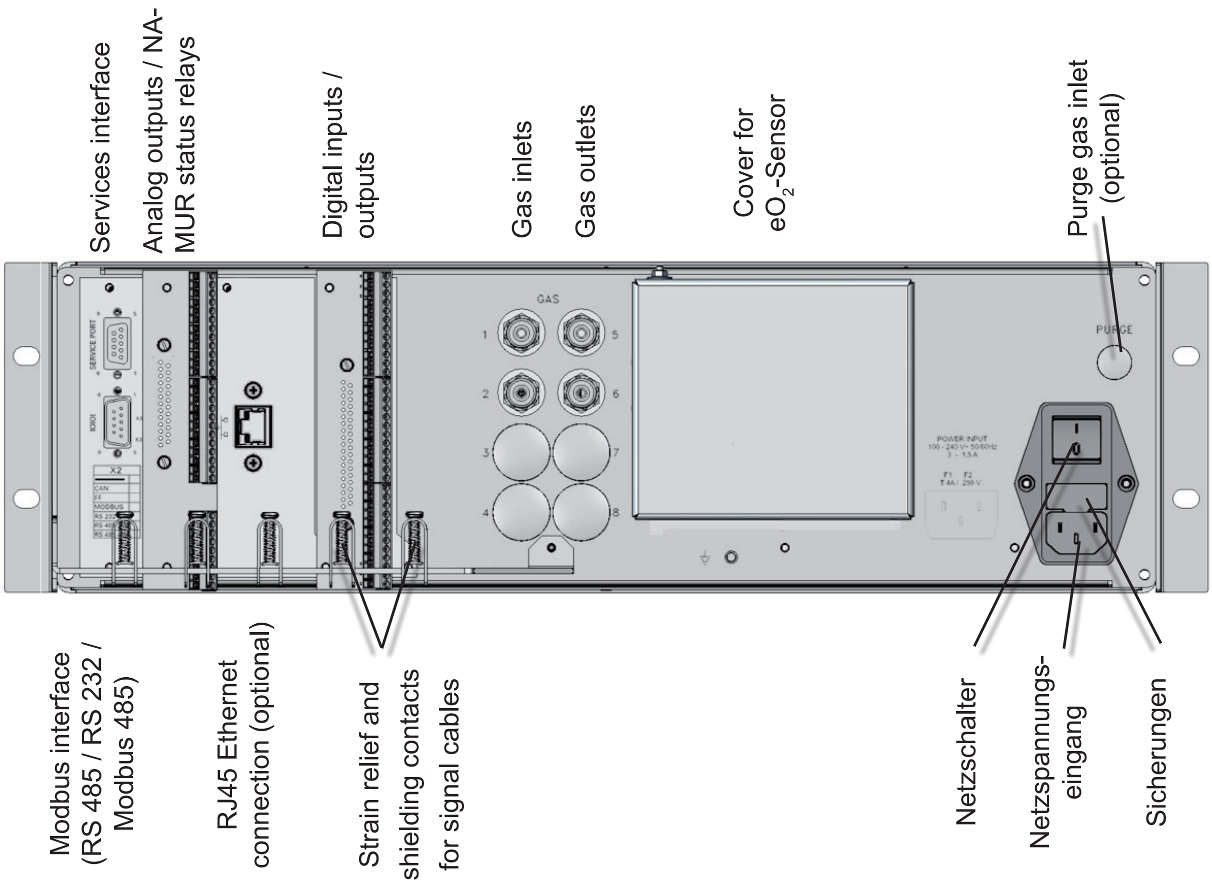


Fig. 4-12: X-STREAM X2GP - Rear panel, with terminal adapters and brackets for rack mounting

4.6.2 Installation - X-STREAM X2GP

Signal inputs and outputs

The number of signal outputs actually available varies according to the unit's configuration.

Analog signals
Relay outputs

Analog signals and relay outputs are on a shared 25-pin submin socket (X1; Fig. 4-13).

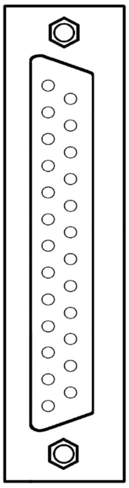
Specification of analog signal outputs: 4 (0)–20 mA; burden: $R_B \leq 500\ \Omega$

Specification of relay outputs 1-4: Dry relay change-over contacts can be used as NO or NC.

Electrical specification: max. 30 VDC, 1 A, 30 W

Note!
Consider the installation notes in section 4.5.

	Signal	Pin
Analog outputs	Channel 1, (+) 4 (0)–20 mA	1
Analog outputs	Channel 2, (+) 4 (0)–20 mA	2
Analog outputs	Channel 3, (+) 4 (0)–20 mA	3
Analog outputs	Channel 4, (+) 4 (0)–20 mA	4
Analog outputs	*unused*	5
	unused	6
	unused	7
Relay contacts (Status signals)	Output1 (Failure) NC	8
Relay contacts (Status signals)	Output1 (Failure) NO	9
Relay contacts (Status signals)	Output1 (Failure) COM	10
Relay contacts (Status signals)	Output3 (Off spec) NC	11
Relay contacts (Status signals)	Output3 (Off spec) NO	12
Relay contacts (Status signals)	Output3 (Off spec) COM	13



Pin	Signal	
14	Channel 1, GND	Analog outputs
15	Channel 2, GND	Analog outputs
16	Channel 3, GND	Analog outputs
17	Channel 4, GND	Analog outputs
18	*unused*	Analog outputs
19	*unused*	
20	Output2 (Maintenance request) NC	Relay contacts (Status signals)
21	Output2 (Maintenance request) NO	Relay contacts (Status signals)
22	Output2 (Maintenance request) COM	Relay contacts (Status signals)
23	Output4 (Function check) NC	Relay contacts (Status signals)
24	Output4 (Function check) NO	Relay contacts (Status signals)
25	Output4 (Function check) COM	Relay contacts (Status signals)

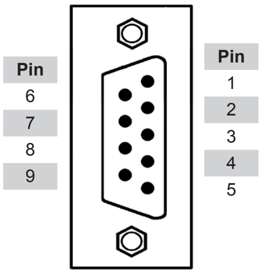
Note!
Configuration of relay contacts as per standard factory setting (NAMUR status signals)

Fig. 4-13: Socket X1 - Analog & Digital Outputs 1-4

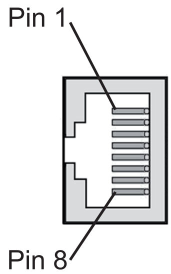
4.6.2 Installation - X-STREAM X2GP

Modbus interface

For specifications and notes on control, see ☞ chapter 7



Pin no.	MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
1	Common	Common	Common
2	*not used*	*not used*	RXD
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*	RXD0(-)	*not used*
9	D0(-)	TXD0(-)	*not used*



Pin no.	Signal
1	TX+
2	TX-
3	RX+
6	RX-
other	*not used*

Ethernet connector

Fig. 4-14: Plug X2 - Modbus interface

Notes!

Consider the installation notes in section 4.5.

*When terminal adapters are used, the Modbus interface terminals are located on the same adapter as those for the **analog** signal outputs (☞ Fig. 4-15, page 4-20).*

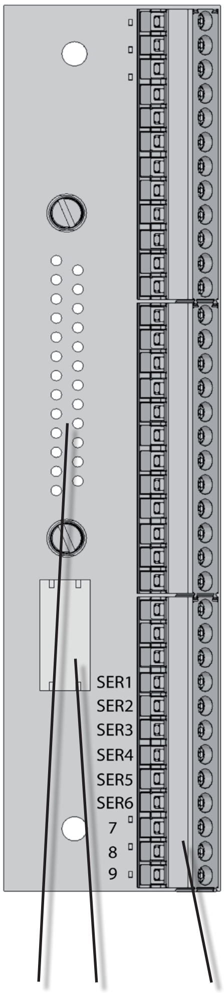
Then a flat flexible cable attached to the terminal adapter is used for connecting to the illustrated 9-pole plug.

X-STREAM analyzers are classified as DTE (Data Terminal Equipment).

4.6.2 Installation - X-STREAM X2GP

The XSTA adapter can optionally be used to connect signal cables to screw-type terminals instead of Submin-D plugs and sockets: it is plugged onto the X1 Submin-D connector on the unit.

To connect any serial interface, the adapter is equipped with a flat flexible cable ending in a 9-pin Submin-D plug, which should be plugged onto the unit's X2 connector.



Pin	Signal	
P2.1	Channel 1, (+) 4 (0)–20 mA	Analog Outputs
P2.2	Channel 1, GND	Analog Outputs
P2.3	Channel 2, (+) 4 (0)–20 mA	Analog Outputs
P2.4	Channel 2, GND	Analog Outputs
P2.5	Channel 3, (+) 4 (0)–20 mA	Analog Outputs
P2.6	Channel 3, GND	Analog Outputs
P2.7	Channel 4, (+) 4 (0)–20 mA	Analog Outputs
P2.8	Channel 4, GND	Analog Outputs
P2.9	*not used*	
P2.10	*not used*	
P2.11	*not used*	
P2.12	*not used*	
P3.1	*not used*	
P3.2	*not used*	
P3.3	Output 1 (Failure), NC	Relay Outputs**)
P3.4	Output 1 (Failure), NO	Relay Outputs**)
P3.5	Output 1 (Failure), COM	Relay Outputs**)
P3.6	Output 2 (Maintenance Request), NC	Relay Outputs**)
P3.7	Output 2 (Maintenance Request), NO	Relay Outputs**)
P3.8	Output 2 (Maintenance Request), COM	Relay Outputs**)
P3.9	Output 3 (Out of Spec), NC	Relay Outputs**)
P3.10	Output 3 (Out of Spec), NO	Relay Outputs**)
P3.11	Output 3 (Out of Spec), COM	Relay Outputs**)
P3.12	Output 4 (Function check), NC	Relay Outputs**)
P4.1	Output 4 (Function check), NO	Relay Outputs**)
P4.2	Output 4 (Function check), COM	Relay Outputs**)
P4.3	*not used*	
P4.4		Serial Interface*)
P4.5		Serial Interface*)
P4.6		Serial Interface*)
P4.7		Serial Interface*)
P4.8		Serial Interface*)
P4.9		Serial Interface*)
P4.10		Serial Interface*)
P4.11		Serial Interface*)
P4.12		Serial Interface*)

1 2 3

1 Connector for plug X1 (on reverse side)
2 Connection for flat cable to plug X2 (cable not illustrated)
3 Screw-type terminals

Fig. 4-15: Configuration of XSTA terminal adapter

Recommended wire gauge:
0.14…1.5 mm²
(AWG 26…AWG 16),
end sleeves not required

Skinning length:
5 mm

Thread:
M2

min. tightening torque:
0.25 Nm

*) See table below

**) Configuration of relay output terminals as per standard factory setting (NAMUR status signals)

Assignment of serial interface terminals

Terminal		MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
P4.4	*SER1*	Common	Common	Common
P4.5	*SER2*	*not used*	*not used*	RXD
P4.6	*SER3*	*not used*	*not used*	TXD
P4.7	*SER4*	*not used*	RXD1(+)	*not used*
P4.8	*SER5*	D1(+)	TXD1(+)	Common
P4.9	*SER6*	*not used*	*not used*	*not used*
P4.10	*7*	*not used*	*not used*	*not used*
P4.11	*8*	*not used*	RXD0(-)	*not used*
P4.12	*9*	D0(-)	TXD0(-)	*not used*

Note!
Consider the installation notes in section 4.5.

4.6.2 Installation - X-STREAM X2GP

Digital inputs

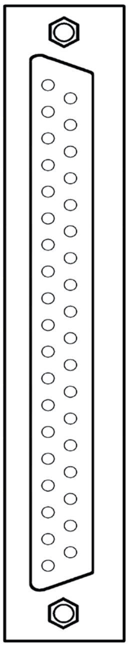
Type:	7 inputs
Electrical specification:	max. 30 V⎓, internally limited to 2.3 mA H Signal: min. 4 V; L Signal: max. 3 V common ground (GND), electrically isolated from chassis earth connection

Digital outputs

Type:	9 outputs, dry relay change-over ontacts, can be used as normally open (NO) or normally closed (NC)
Electrical specification:	max. 30 VDC, 1 A, 30 W

Notes!
Depending on the configuration, an analyzer may be fitted with up to 2 of these sockets (the unit is thus equipped with 14 digital inputs and 18 digital outputs). To aid identification, the sockets are labelled X4.1 and X4.2.
Consider the installation notes in section 4.5.

	Signal	Pin
Digital inputs	Input 1	1
	Input 2	2
	Input 3	3
	Input 4	4
	GND for all digital inputs	5
	unused	6
	unused	7
Digital outputs	Output 5 NC	8
	Output 5 NO	9
	Output 5 COM	10
	Output 6, NC	11
	Output 6, NO	12
	Output 6, COM	13
	Output 7, NC	14
	Output 7, NO	15
	Output 7, COM	16
	Output 8, NC	17
	Output 8, NO	18
	Output 8, COM	19



Pin	Signal	
20	Input 5	Digital inputs
21	Input 6	
22	Input 7	
23	Output 9, NC	Digital outputs
24	Output 9, NO	
25	Output 9, COM	
26	Output 10, NC	
27	Output 10, NO	
28	Output 10, COM	
29	Output 11, NC	
30	Output 11, NO	
31	Output 11, COM	
32	Output 12, NC	
33	Output 12, NO	
34	Output 12, COM	
35	Output 13, NC	
36	Output 13, NO	
37	Output 13, COM	

Note!
The configuration illustrated here is that of the first socket, labelled X4.1.
Inputs 8-14 and outputs 14-23, are on the second socket (X4.2), if installed.

Fig. 4-16: Sockets X4.1 and X4.2 - Pin configuration

4.6.2 Installation - X-STREAM X2GP

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 onto the X4.1 and X4.2 (if fitted) Submin-D connectors on the unit.

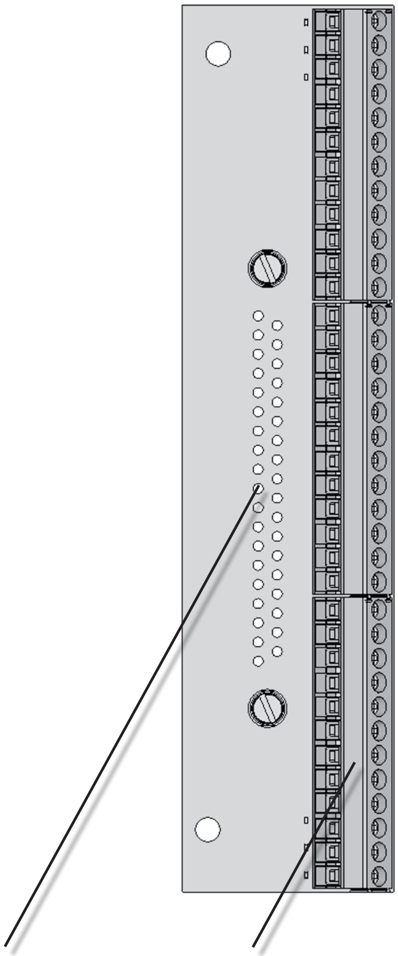
Recommended wire gauge:
0.14…1.5 mm², end sleeves not required

Skinning length:
5 mm

Thread:
M2

Min. tightening torque:
0.25 Nm

Note!
The configuration illustrated here is that of the first adapter (on socket X4.1).
Inputs 8-14 and outputs 14-23 are on the second adapter (on socket X4.2), if installed.



Pin	Signal	
P3.1	Input 1	Digital inputs
P3.2	Input 2	
P3.3	Input 3	
P3.4	Input 4	
P3.5	Input 5	
P3.6	Input 6	
P3.7	Input 7	
P3.8	GND for inputs 1-7	
P3.9	*unused*	
P3.10	Output 5, NC	Digital outputs
P3.11	Output 5, NO	
P3.12	Output 5, COM	
P4.1	Output 6, NC	
P4.2	Output 6, NO	
P4.3	Output 6, COM	
P4.4	Output 7, NC	
P4.5	Output 7, NO	
P4.6	Output 7, COM	
P4.7	Output 8, NC	
P4.8	Output 8, NO	
P4.9	Output 8, COM	
P4.10	Output 9, NC	
P4.11	Output 9, NO	
P4.12	Output 9, COM	
P2.1	Output 10, NC	
P2.2	Output 10, NO	
P2.3	Output 10, COM	
P2.4	Output 11, NC	
P2.5	Output 11, NO	
P2.6	Output 11, COM	
P2.7	Output 12, NC	
P2.8	Output 12, NO	
P2.9	Output 12, COM	
P2.10	Output 13, NC	
P2.11	Output 13, NO	
P2.12	Output 13, COM	

1 2

1 Connector for socket X4.1 / X4.2 (on reverse side)
2 Screw-type terminals

Note!
Consider the installation notes in section 4.5.

Fig. 4-17: Configuration of XSTD terminal adapter

4.6.3 X-STREAM X2XF Field Housings (Single XLF; Dual XXF)

Fitted with four eyebolts and featuring IP66 / Type 4X protection, the X-STREAM X2XF field housings can be mounted in the open air on a wall or frame with no extra work.

Note!

Take care to reserve space at the right side of the instrument for laying the cables!

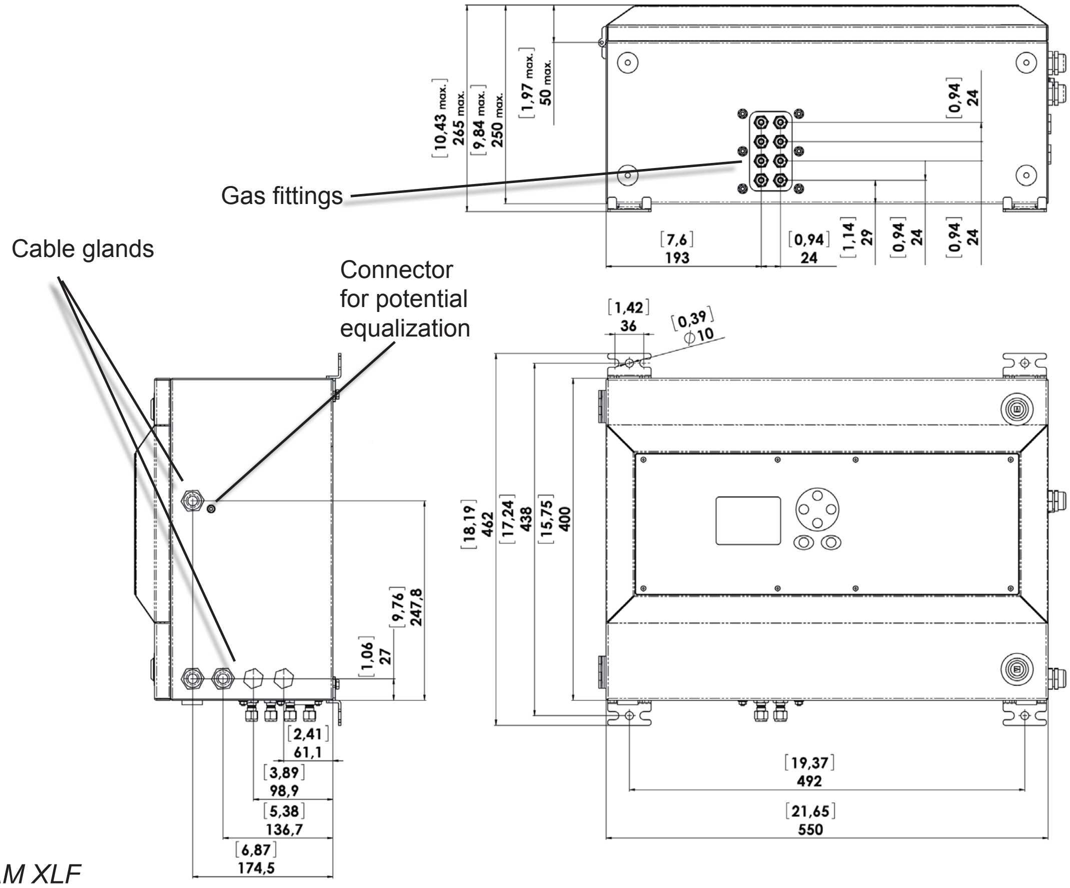


Fig. 4-18: X-STREAM XLF

CAUTION

HEAVY INSTRUMENT

X-STREAM X2XF field housing analyzers intended to be wall mounted and/ or outdoor installed, weigh up to 45 kg (99 lbs), depending on the chosen options!

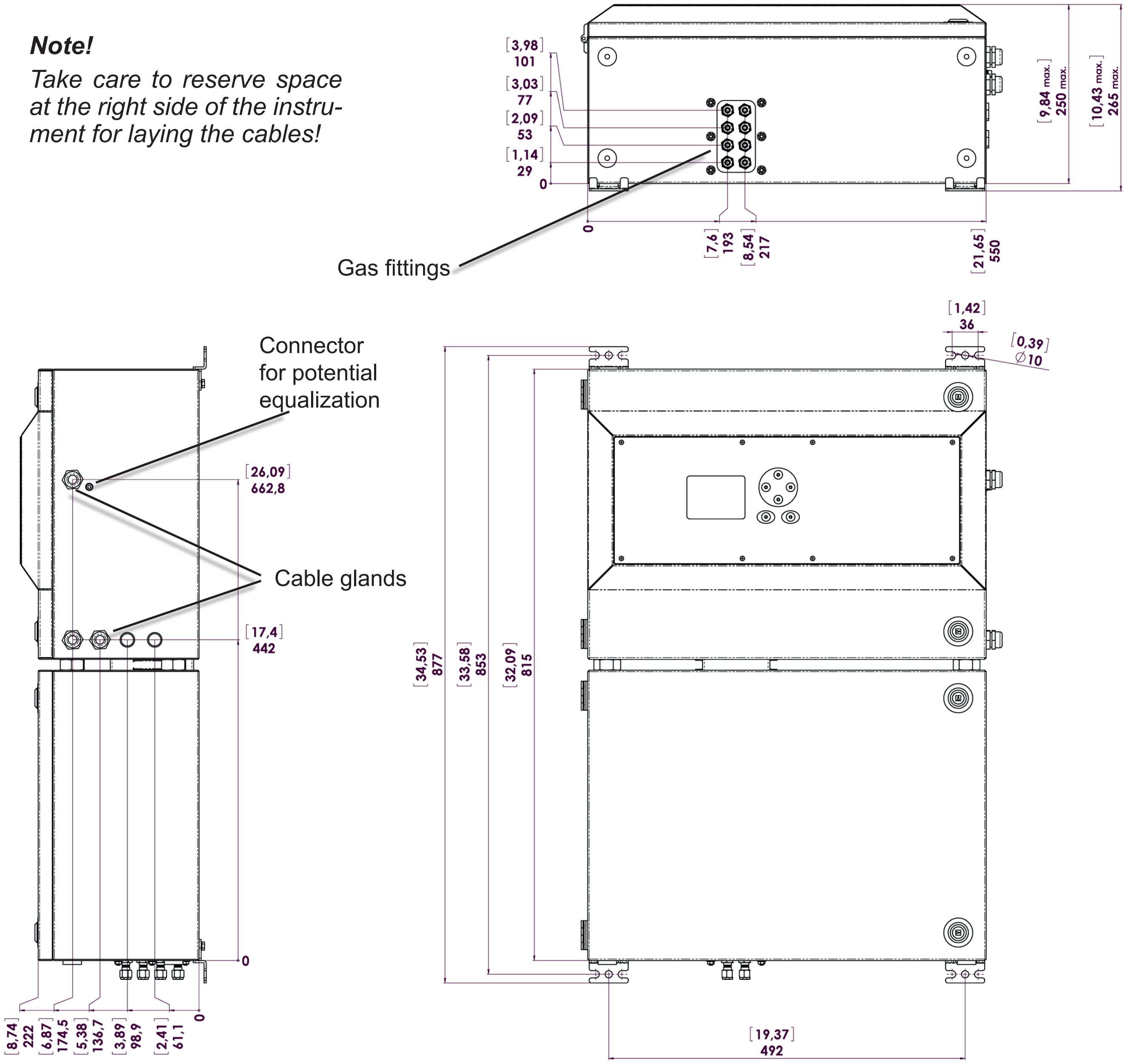
Use two persons and/or suitable tools for transportation and lifting these instruments!

Take care to use anchors and bolts specified to be used for the weight of the instruments!

Assure that the wall/device for installation is sufficiently attached and stable to carry the instrument!

4.6.3 Installation - X-STREAM X2XF Field Housings

Note!
Take care to reserve space at the right side of the instrument for laying the cables!



All dimensions in mm
[inches in brackets]

Fig. 4-19: X-STREAM XXF

4.6.3 Installation - X-STREAM X2XF Field Housings

Power and signal cables are connected using internal screw-type terminals. This requires opening the unit by releasing the fasteners on the housing.

Gas connectors are accessible from the underside of the instrument.

The number and configuration of the gas inlets and outlets depends on the analytical application, and is noted on a sticker on the underside of the instrument next to the connectors.

Note on variation XXF!

In case of the dual compartment version XXF, the electrical connections are established in the upper compartment, and the gas connections to fittings at the lower compartment.

Besides this, the design and layout of terminals and fittings are the same as with the single compartment version XLF.

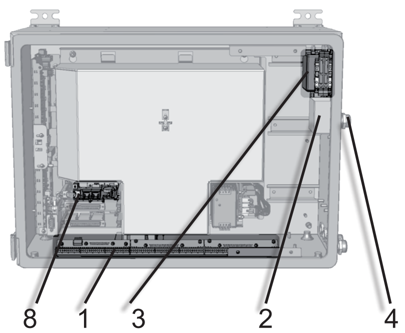
To simplify installation, we recommend labelling the gas lines in accordance with these markings. This avoids confusion should the analyzer need to be disconnectedfor maintenance.

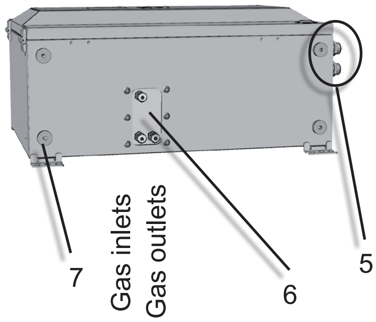
CAUTION

GASKETS AT LOW TEMPERATURES

Consider that enclosure gaskets may be frozen when the instrument is installed outdoors. Carefully open the enclosure at temperatures below -10 °C (14 °F) to not damage the gaskets.

Damaged gaskets void the ingress protection, possibly causing property damage, personal injury or death.





1 Terminals for signal cables
2 Mains filter
3 Power connections with integrated fuses
4 Gland for power cable

5 Glands for signal cables
6 Gas inlets and outlets
7 Plugs for openings to connect housings
8 Ethernet connector (optional)

Fig. 4-20: X-STREAM X2XF Field Housings - Arrangement of Terminals, Cable Glands and Gas Fittings

4.6.3 Installation - X-STREAM X2XF Field Housings

Gas inlets and outlets

Quantity:		max. 8 (+ 1 purge gas inlet (optional))
Specification:		6/4 mm PVDF
	optional	6/4 mm or ¼", stainless steel, others on request

Preparation of signal cables

All signal cables are connected to screw-type terminals located inside the housing. Access to the internal components is gained by releasing the two fasteners at the front door and opening it to the left.

Recommended wire gauge:	0.14…1.5 mm^2 (AWG 26…AWG 16), end sleeves not required
Skinning length:	5 mm (0.2")
Thread:	M2
Min. tightening torque:	0.25 Nm (2.21 in.lb)

All cables must be fed through cable glands and secured with a gland nut.

When correctly installed, the glands act as a strain relief and guarantee EMC (electromagnetic compatibility):

Installing cable glands with shielded cables

1. Strip the cabel
2. Expose braided shield

3. Feed cable through dome nut and clamping insert
4. Fold braided shield over clamping insert
5. Make sure that braided shield overlaps the O-ring by $\frac{3}{32}$“ (2 mm)

6. Push clamping insert into body and tighten dome nut
7. Assemble into housing and you´re done!

4.6.3 Installation - X-STREAM X2XF Field Housings

Signal inputs and outputs

The number of actually available signal outputs, and also the number of built-in modules with screw-type terminals, varies according to the configuration of the unit.

A maximum of three modules with 36 terminals each can be fitted.

The terminals can be accessed by opening the front panel of the instrument.

Characteristics of terminals:

Recommended wire gauge:	0.14…1.5 mm^2 (AWG 26…AWG 16), end sleeves not required
Skinning length:	5 mm (0.2")
Thread:	M2
Min. tightening torque:	0.25 Nm (2.21 in.lb)

WARNING

ELECTRICAL SHOCK HAZARD

Verify the power supply at installation site meets the specification given on the analyzer´s nameplate label, before installing the instrument!

Verify power cables are disconnected and/or instrument is de-energized prior to working at the terminals!

Verify the power cord is layed with a distance of at least 1 cm (0.4 in) to any signal cable to ensure proper insulation from signal circuits!

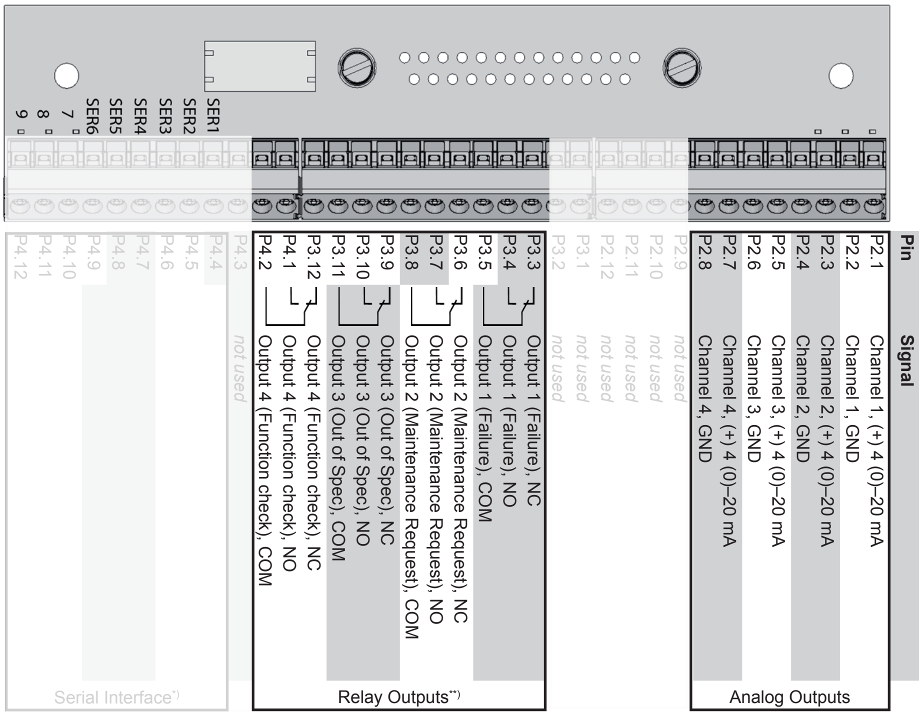
4.6.3 Installation - X-STREAM X2XF Field Housings

Analog signals
Relay outputs

Terminals for analog signals and relais outputs 1 - 4 are located on the outer left module (terminal block X1; Fig. 4-21).

Analog signal output specification:	4 (0)–20 mA; load: $R_B \leq 500\ \Omega$
Specification of relay outputs 1-4:	dry relay change-over ontacts, can be used as normally open (NO) or normally closed (NC)
Electrical specification:	max. 30 VDC, 1 A, 30 W

Note!
Consider the installation notes in section 4.5 and the notes on installing cable glands on page 4-24.



**) Configuration of relay output terminals as per standard factory setting (NAMUR status signals)

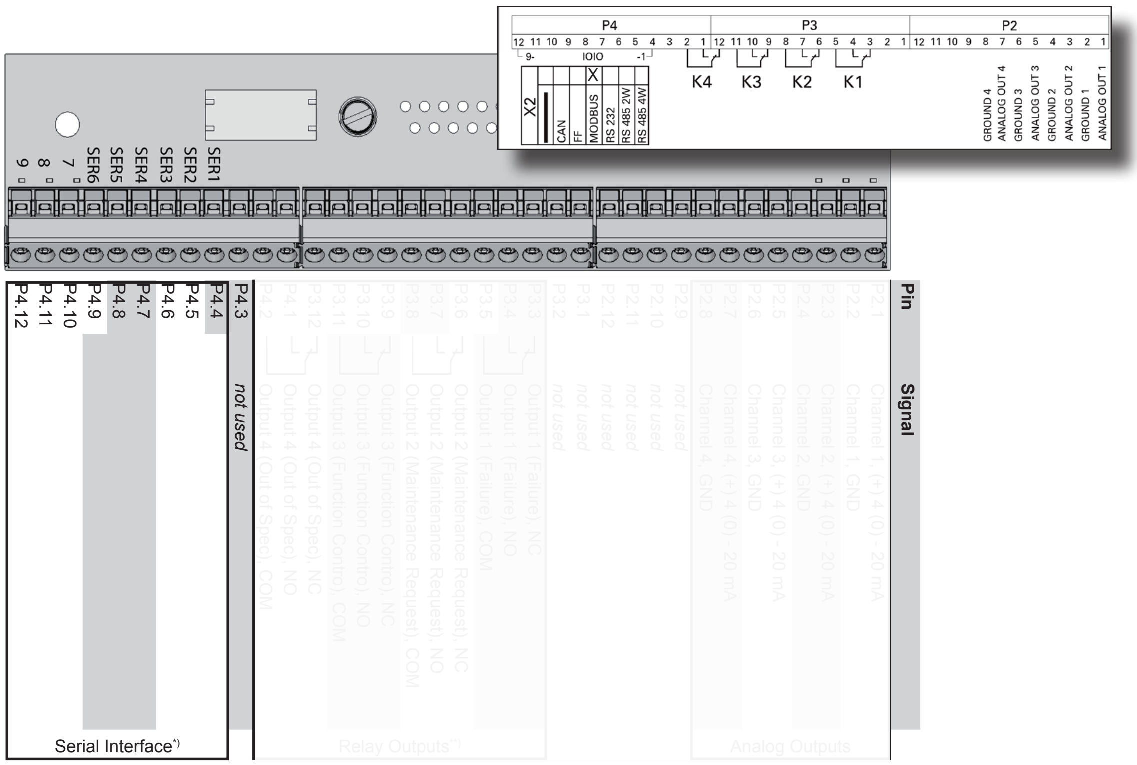
Fig. 4-21: Terminal block X1 - Analog signals and relay outputs 1-4

4.6.3 Installation - X-STREAM X2XF Field Housings

Modbus interface

Specification and interface control:
☞ Chapter 9

The 9 terminals on the left (28 - 36) of the right most strip carry the Modbus interface signals.



*) See table below

Terminal		MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
P4.4	*SER1*	Common	Common	Common
P4.5	*SER2*	*not used*	*not used*	RXD
P4.6	*SER3*	*not used*	*not used*	TXD
P4.7	*SER4*	*not used*	RXD1(+)	*not used*
P4.8	*SER5*	D1(+)	TXD1(+)	Common
P4.9	*SER6*	*not used*	*not used*	*not used*
P4.10	*7*	*not used*	*not used*	*not used*
P4.11	*8*	*not used*	RXD0(-)	*not used*
P4.12	*9*	D0(-)	TXD0(-)	*not used*

Notes!
Consider the installation notes in section 4.5 and the notes on installing cable glands on page 4-24.

X-STREAM analyzers are classified as DTE (Data Terminal Equipment).

The type of serial interface is marked on a label nearby the terminals (see sample above)

Fig. 4-22: Terminal block X1 - Modbus interface

4.6.3 Installation - X-STREAM X2XF Field Housings

Optional Modbus RJ45 connection

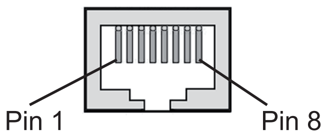
If fitted, the optional RJ45 connection is located on an electronics board in the card cage section of the unit (Fig. 4-9, pg. 4-23).

To install this connection, a cable must be fed through the cable entry **without** a connector.

The connector can be wired on when the free end has been fed into the instrument:

We recommend the VARIOSUB RJ45 QUICK-ON connector (PHOENIX CONTACT), which is supplied with the unit and requires no special tools. Wiring instructions can be found in the separate manual supplied with the connector.

Note!
Please note that although the Modbus terminals (☞ previous page) are still installed, they are not connected!



Pin no.	Signal
1	TX+
2	TX-
3	RX+
6	RX-
other	*not used*

Fig. 4-23: X-STREAM X2XF Field Housings - Ethernet connector

4.6.3 Installation - X-STREAM X2XF Field Housings

Digital inputs

Quantity: 7 (1 terminal block) or
14 (2 terminal blocks)

Electrical specification: max. 30 V⎓, internally limited to 2.3 mA
H Signal: min. 4 V;
L Signal: max. 3 V
common ground (GND), electrically isolated from chassis earth

Digital outputs

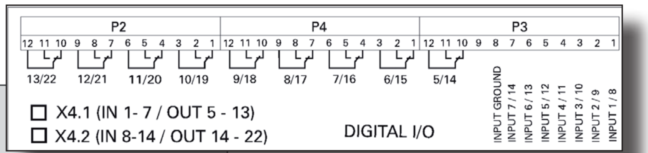
Quantity: 9 (1 terminal block) or
18 (2 terminal blocks),
dry relay change-over ontacts,
can be used as normally open (NO) or normally closed (NC)

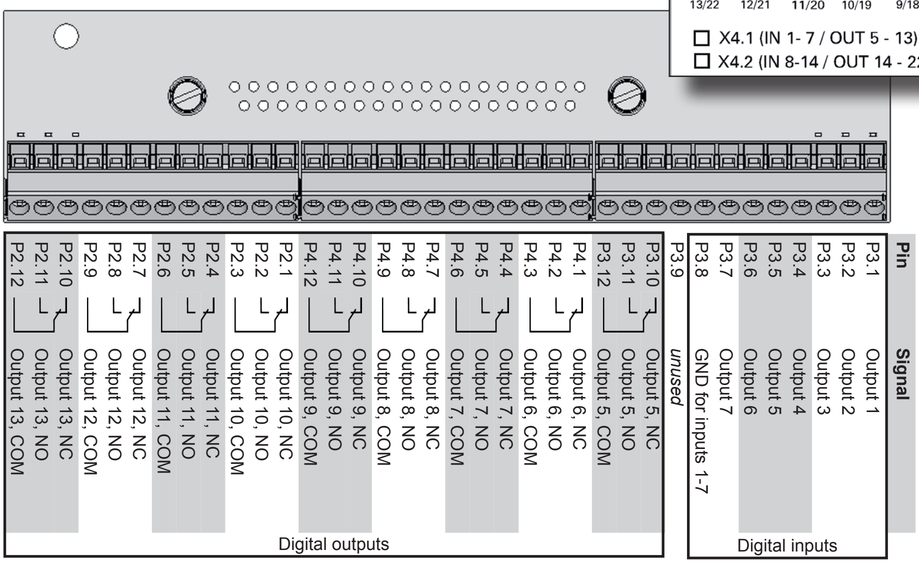
Electrical specification: max. 30 VDC, 1 A, 30 W

Notes!

Depending on configuration, an analyzer can be fitted with up to two of these terminal blocks (the unit will then feature 14 digital inputs and 18 digital outputs). To aid identification, the sockets are labelled X4.1 and X4.2 (see sample of label to the right).

Consider the installation notes in section 4.5. and the notes on installing cable glands on page 4-24.





Note!
The configuration illustrated here is that of the first adapter.
Inputs 8-14 and outputs 14-23, if available, are on the second adapter.

Fig. 4-24: Terminal blocks for digital inputs and outputs

4.6.3 Installation - X-STREAM X2XF Field Housings

Connecting the power cord

The power cord is connected to screw-type terminals located inside the housing.

Supported wire cross sections:	0.2…4 mm^2 (24…12 AWG), no need to use wire end sleeves
Cable skinning length:	8 mm (0.315 inch)
Hole diameter:	1.2 mm (0.05 inch)
Screw thread:	M 3
Tightening torque, min:	0.5 Nm (4.4 in.lb)

WARNING

ELECTRICAL SHOCK HAZARD

Verify the power supply at installation site meets the specification given on the analyzer´s nameplate label, before installing the instrument!

Verify power cables are disconnected and/or instrument is de-energized prior to working at the terminals!

Verify the power cord is layed with a distance of at least 1 cm (0.5“) to any signal cable to ensure proper insulation from signal circuits!

Feed the power cable through the cable gland at the instrument´s right side and strip the outer insulation. Strip the individual wires and connect to the terminals (a label is located next to the terminals on the mains filter housing).

Finally, tighten the outer dome nut to secure the power cable.

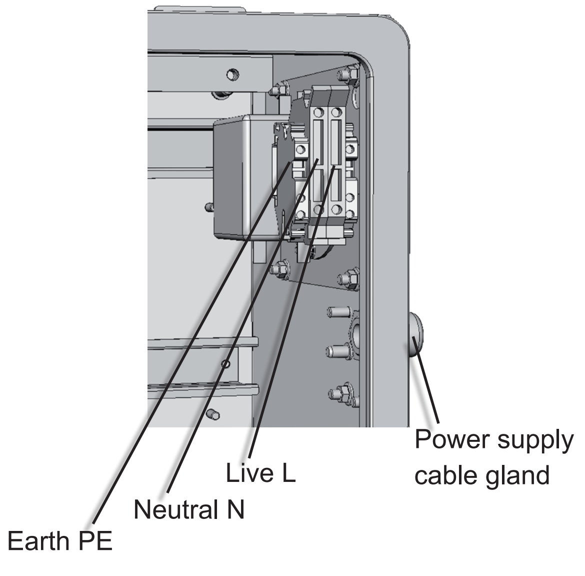


Fig. 4-25: Power supply connections

4.6.3 Installation - X-STREAM X2XF Field Housings

WARNING

ELECTRICAL SHOCK HAZARD BY MISSING EARTHING CONDUCTOR

Before completing the electrical connection of the instrument, verify cables are inserted and connected in correct manner!

Ensure the earthing conductor (protective earth; PE) is connected!

Completing the installation process

After all connections are correctly made and checked,

- close the front panel and secure with the two fasteners.

To achieve best and proper measuring results you must ensure the gas path system does not have leaks. For this reason we recommend to carry out a leak test, as it is described within ☞ Chapter 7 "Maintenance and other Procedures".

4.7 Notes On Wiring Signal Inputs and Outputs

Emerson Process Managament has made every effort during the development process to ensure that the X-STREAM analyzer series ensures electromagnetic compatibility (EMC) with respect to emission and interference resistance, as confirmed by EMC measurements.

However, EMC 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.

4.7.1 Electrical Shielding Of Cables

In order to minimise ambient electromagnetic interference, it is necessary to take care making all electrical connections between the analyzer and any other devices:

- We recommend using only shielded signal cables. The shielding must be connected at both ends to the housing (Fig. 4-26).

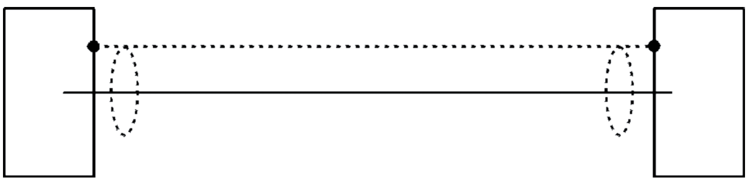


Fig. 4-26: Shielded signal cable, shielding connected at both ends.

4.7 Installation - Notes on Wiring

On-site conditions often differ from test environments and may require special precautions. Such a case arises when strong electromagnetic fields 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 are described here. Fitters familiar with EMC problems must decide which method should be emplyed.

- 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.

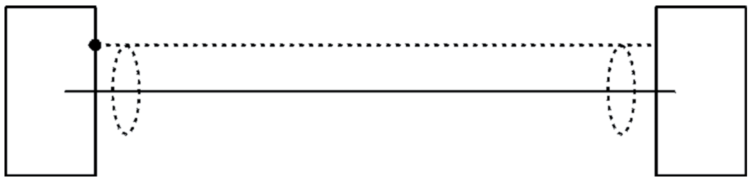


Fig. 4-27: Shielded signal cable, shielding connected at one end.

- Cables with double shielding are used: 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).

This method is more expensive, but gives the best protection against external interference and against interference currents.

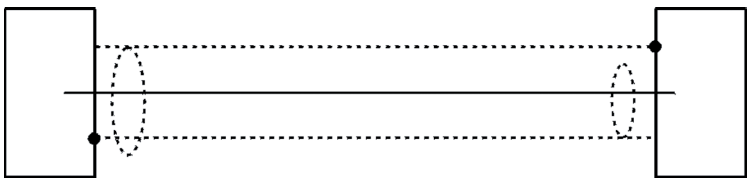


Fig. 4-28: Signal cable with double shielding, shieldings connected at alternate ends.

X-STREAM X2GP with screw-type terminal adapters

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 by means of shield connector terminals:

- Strip the signal cable to a length of 20 cm (8"). Take care to not damage the braided shield!
- Pull up the contact part of the shield connector terminal,
- feed through the cable as illustrated in fig. 4-30,
- release the contact part down onto the braided shield.

This results in a secure contact with the cable shielding and improves the unit's interference resistance.

The individual wires are then connected as described in section 4.5.2.

The shield connector must be ordered to fit the cable diameter, and can be retrofitted:

Ø 1.5 - 6.5 mm: part # ETC02019
Ø 5 - 11 mm: part # ETC02020
Ø 10 - 17 mm: part # ETC02021
Ø 16 - 24 mm: part # ETC02022

Fig. 4-29: Shield connector terminal with cable

4.7.2 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 propogates 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:

- 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 (Fig. 4-30).

Compatible filter components for standard valves are available on request.

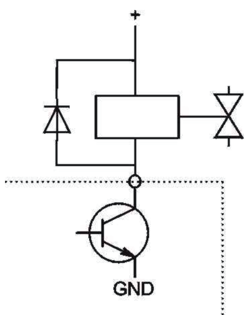


Fig. 4-30: Suppressor diode for inductive loads.

4.7.3 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.

Such loads require external relays serving as de-coupling 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 (Fig. 4-31).

As previously described, the use of suppressor diodes for inductive loads is highly recommended.

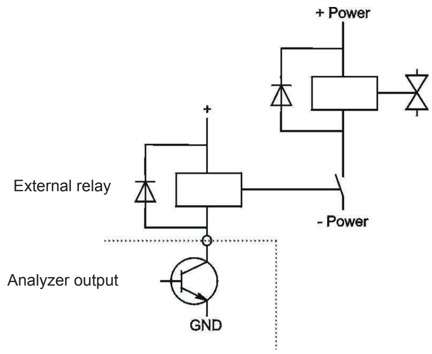


Fig. 4-31: Driving high-current loads

4.7.4 Driving Multiple Loads

Frequently, several loads in one system are controlled by several analyzer outputs, whereby the power for the loads derives from a common source.

Special care is needed when wiring the loads to minimize interference from switching these loads:

- **avoid** connected the loads in series:

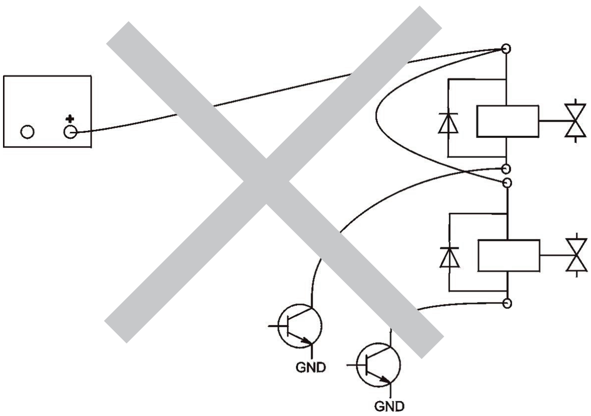


Fig. 4-32: Loads in series

- **It is recommended** that the loads be wired in parallel, and each load is separately connected to the power supply. Beginning at the distribution point, both the + and the - wires of each load are laid together to the load (Fig. 4-33). Interference is further reduced if a twisted multi-core cable is used.

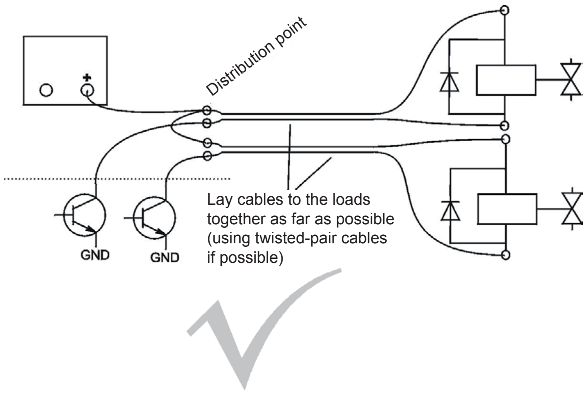


Fig. 4-33: Loads in parallel

Chapter 5
Startup

5.1 Introduction

Once the unit has been unpacked and installed, it is recommended to first check the settings and if necessary adjust them to the user's needs. e.g:

- What hardware is installed?
- Is the unit configured to your needs (alarms, inputs, outputs, etc.)

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

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 familiarise yourself with the unit and its software, and if necessary adjust the settings to your own requirements.

CAUTION

OPERATION AT LOW TEMPERATURES

When operating an instrument at temperatures below 0 °C (32 °F), do NOT apply gas nor operate the internal pump before the warmup time has elapsed!

Violation may result in condensation inside the gas paths or damaged pump diaphragm!

5.2 Front Panel Elements

All X-STREAM X2 gas analyzers have an alphanumeric display with four lines of 20 characters to display measuring and status information and the easy-to-use menu-based user interface for entering parameters. For ease of understanding, the user can at any time select one of three languages stored in the unit (currently available: English, French, German, Italian, Portuguese and Spanish in various combinations).

Units are operated using six keys on the front panel.
Three LEDs on the front panel enable the operating status to be recognised instantly.

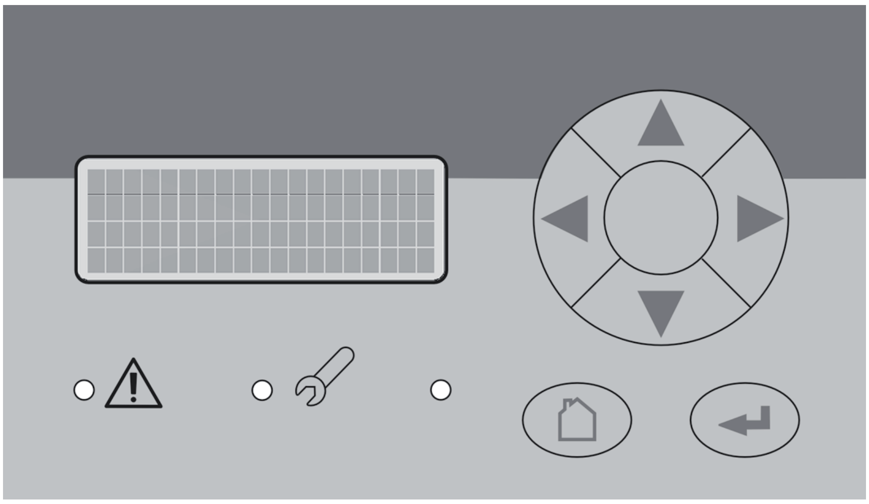
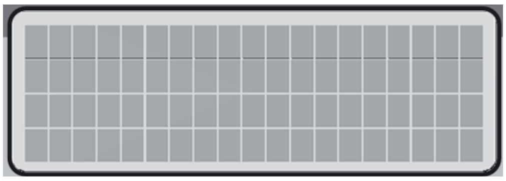


Fig. 5-1: X-STREAM Front Panel

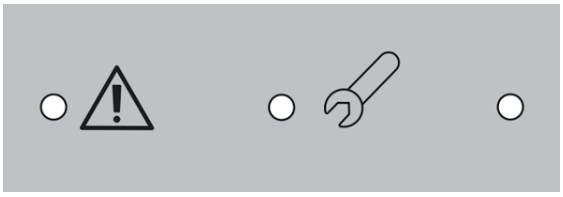
5.2 Front Panel Elements

5.2.1 Display

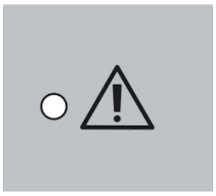


The display has 4x20 characters, either liquid crystal or vacuum fluorescent (LCD or VFD).
What information is displayed depends on the currently displayed menu.

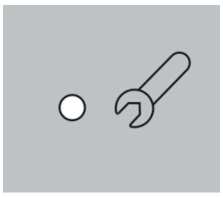
5.2.2 Status LED



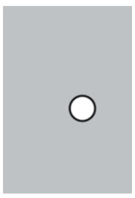
Three status LED indicate the unit's status, recognisable from a distance.
Status is indicated in accordance with the German NAMUR NE 44 recommendations.



"Failure" is indicated when this red LED is lit.

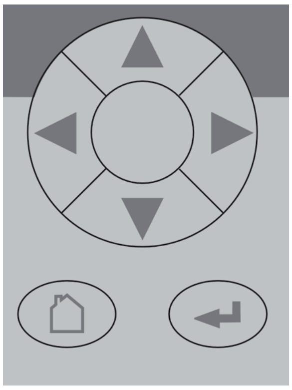


A flashing red LED in the middle indicates "Maintenance request", "Function check" or "Off-spec operation".

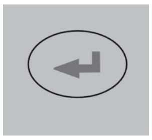


The third, green LED indicates the power supply status:
on: power supply OK
off: power supply interrupted

5.2.3 Keys

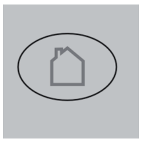


Six keys enable the use of the menu system. Depending on the operational mode (measuring, browsing menus, editing) they have the following functions:



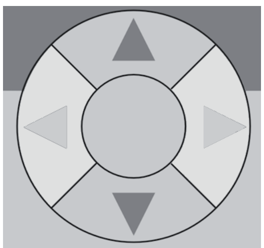
ENTER key:

Mode	***Function***
Measuring	Leaves the measurement display
Browsing	Accesses submenu (..) or executes command (!)
Editing	Confirms new entry



MEASURE key:

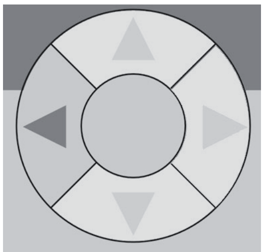
Mode	***Function***
Measuring	*(no function)*
Browsing	Returns to measurement display
Editing	Cancels entry



UP / DOWN keys:

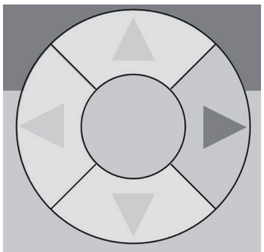
Mode	***Function***
Measuring	Leaves the measurement display
Browsing	Selects menu line
	Goes to previous/next page, when currently in a line beginning with ▲/▼
Editing	Changes current parameter

5.2 Front Panel Elements



LEFT key:

Mode	***Function***
Measuring	Leaves the measurement display
Browsing	Goes up 1 level or page in menu system
Editing	Moves cursor 1 space
	Leaves channel selection
	Cancels editing of given parameter
	Goes to previous page, when ▲ showing in first line



RIGHT key:

Mode	***Function***
Measuring	Leaves the measurement display
Browsing	Accesses submenu (..)
Editing	Goes to next page, when ▼ showing in fourth line
	Moves cursor 1 space

5.3 Symbols Used

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

Symbols used in this section

Symbol	Description
Within Process Descriptions	
Setup..	Menu title
Setup.. Analog outputs..	Parent (*Setup*) and current Menu (*Analog outputs*)
Analog outputs.. Output1 *(2...4)*	As an example, the menu for Output1 is displayed; the menus for outputs 2 to 4 are identical
Zero calibration.. Span calibration.. Adv. Calibration.. ▼Apply gas..	Display ***Note!*** *Menus or lines on a grey background are optional or context-dependent, and are not always displayed*
   	Access levels: Access level 1 *(user)* Access level 2 *(expert)* Access level 3 *(administrator)* Access level 4 *(service level)*

Others

Convention	Description
Within Text	
(MENU TITLE) ☞ 6.2.2, page 6-12	For a detailed description of the *Menu*, see section 6.2.2 on page 6-12.
CONTROL.. - ZOOM..	From within the CONTROL menu select the ZOOM menu.
"Valves"	Parameter name
Never, 1 min	Values to be selected
0 ... 2000	Value to be entered

5.4 Software

The analyzer software displays measurement results and status messages, allows parameters to be set and edited and allows maintenance functions (e.g. calibration) to be carried out.
To make it possible to perform all these functions on a 4x20 display, the software is organised hierarchically: measurement display is on the topmost level, while menus and submenus are below (☞ fig. 6-1, page 6-3).
The following methods are used to distinguish between various functions, e.g. executing commands:

Function	Description
Displaying TEXT	Simple text (not selectable with cursor)
Editing VARIABLES	A variable description ends with a colon and the line can be made up of up to 3 elements: 1. description 2. value: number or text 3. unit (optional) *Examples:* Span gas: 2000 ppm Tol.Check: Off Variables without a colon cannot be edited.

Function	Description
Executing COMMANDS	A command line text ends in a colon; when this line is selected and ENTER pressed, a command is executed, e.g. a calibration procedure. *Example:* Start calibration !
Selecting a MENU	A menu line text ends in two dots; when this line is selected and ENTER pressed, a submenu is opened. *Example:* Setup..

5.4.1 Navigating and Editing

Selecting a line

Lines are selected using the ↑↓ (UP/DOWN) keys.
The cursor is displayed over the first character of the selected line. It is moved down with the DOWN key and up with the UP key.
If the cursor is in the first line, pressing the ↑ key will move it to the last line.

If the cursor is in the last line, pressing the ↓ key will move it to the first line.

An action in the selected line is initiated by pressing the ↵ key, i.e. opening a new menu, starting a procedure or entering edit mode.
If a selected parameter has been changed, the “function check” status is set, with the following consequences:

- the middle LED lights
- the NAMUR relay is activated.

The status can be reset by acknowledging it in the "Acknowledgements" menu (☞ 6.2.2.5, page 6-12).

A "function check" message set off by editing a parameter is **automatically** reset upon returning to the measurement display.

Browsing

Some menus have more than four entries, and these cannot all be displayed at once. In these menus, an indicator in the last (▼) or first (▲) line indicates the direction the menu continues in.

To show the following page, the cursor is placed in the line with the indicator and the UP or DOWN key pressed. Alternatively, the LEFT or RIGHT key can be used, irrespective of where the cursor is located.

```
Line 1
Line 2..
Line 3
▼Line 4
```

Menu continues downwards..

```
▲Line 1
Line 2..
Line 3
▼Line 4
```

Menu continues upwards and downwards..

```
▲Line 1
Line 2..
Line 3
Line 4
```

Menu continues upwards.

Editing

Editing mode enables the setting of a parameter. It is initiated by pressing the ↵ key.
The cursor is now placed over the last character of the current value. Pressing the ↑↓ keys change the selected character; if it is a list of possible values, the entire value is changed.
The ← and → keys are used to select a specific character for editing.
Which characters are available 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 leave editing mode:

↵ key: the value is verified (e.g. min/max). If the value is possible, it is saved and the new value displayed; if not, an error message is displayed.

key: Cancel: all settings and changes are reset to their former values.

Component selection menu

A single channel analyzer has only one measurement channel (component): editing any parameter will only effect this one channel.

A multi-channel analyzer requires that a channel must be selected before its parameters can be changed. When this selection is necessary, a menu is automatically displayed; it is not displayed on single-channel units.

```
  Select component

Component:     CO2.1
     Back -
```

5.4.2 Access Levels

Access levels can be used to prevent changes to parameters by unauthorised 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 allows access to system admin parameters, e.g. for data capture and processing systems.

Level two covers the expert settings, e.g. basic settings for calibration.

Level one is the user level and includes parameters which should be set by trained personnel.

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

In this chapter, the descriptions of the individual menus also indicate which level the menus are in. 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

It is recommended to set new access codes if they are to be activated (☞6.2.3.1.2, page 6-18).

Note!

*If a lower level is **locked** (i.e. its code activated), all higher levels will also be **locked.***

*If a higher level is **unlocked** (i.e. its code deactivated), all lower levels will also be automatically **unlocked**.*

Entering access codes

If an access code is required for a menu, the following message is displayed:

```
   Access Code 1

Code        00000001
  Back - Press
```

Use:

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

or

- the MEASURE key to leave edit mode and return to the previous display.

5.4.3 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 (the two confirmation messages are displayed only for a few seconds):

```
        (i)

 -COMMAND EXECUTED-
```

Confirmation of execution of command:
Confirms that a procedure (e.g. calibration) has been started.

```
    Wrong Input
Min:             500
Max:          10.000
     Press ↵
```

Information on incorrect entry:
The value entered by the user is outside valid limits. The display indicates what limits apply.
Pressing ↵ returns the display to the previous screen to allow a valid setting to be entered.

```
        (i)

    CANCELLED
```

Confirmation of cancellation:
Confirms that a procedure (e.g. calibration) has been aborted.

5.5 Powering Up

5.5.1 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 time remaining for the boot sequence counts down in the display.

5.5.2 Measurement Display

The measurement display is shown

- automaticaly on completion of the boot sequence
- when the MEASURE key is pressed
- automatically after a set period of time of inactivity (i.e. with no keys being pressed).

The information displayed in the four lines of the measurement display can be determined by the operator:

- Sample gas components, measuring results and measuring units for each channel
- additional measurements, e.g. pressure, gas flow, temperature
- nothing (empty line)

The factory settings are as follows:

Line 1: measured value of channel 1
Line 2: measured value of channel 2
Line 3: measured value of channel 3
Line 4: measured value of channel 4

Note!
If less than four channels are installed in the unit, only the values of the available channels will be shown.

Line 4 is also used to display plain text status information (errors, maintenance requests, function checks or off-spec performance).
If such messages are active, line 4 alternates between the messages and the parameter selected for line 4.

Active messages are stored in an internal buffer. If there is more than one message in the buffer, the display will cycle through them.
Each message is not just shown in the display as text, but also indicated by the appropriate LED on the front panel and the activation of the appropriate NAMUR relay (if a relay has been assigned to that NAMUR function; ☞ page 6-37).

Note!
There are also functions, that do activate a relay or LED, but are not shown on the display (e.g. concentration alarms). In such cases, check the status menu for more information.

Note!
Beginning with software rev. 1.1, X-STREAM X2 supports 2 measurement display pages, to show up to 8 measuring results (☞ page 6-15). Use the LEFT/RIGHT keys to switch between both pages.

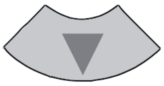
```
CO2.1       135.1 ppm
O2.2       201952 ppm
CO.3         58.8 ppm
H2.4          1.5 %
```

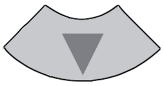
MEASUREMENT DISPLAY

Startup
5

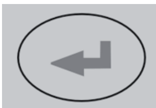
5.6 Selecting the Language

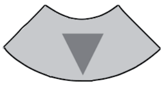
If the analyzer is operational and it becomes clear that the incorrect language has been set, which is unintelligible to the operator, the following sequence of keypresses (starting at the measurement display) can be used to set the language.

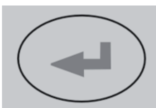


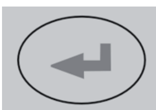


If the system has been set up accordingly, the code for access level 1 must be entered at this point to enable access to the following menu.
Note!
The factory setting for this unit is "no code required". For ease of operation, it is recommended to use the factory settings for access codes while setting 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.

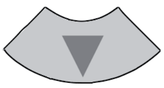


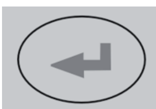






***Note**!*
The fourth press of the ENTER key in this sequence access the "Language" parameter line.





The DOWN key changes the language. Pressing ENTER will set this language and the display is updated accordingly.
If the selected language is not the intended one, the previous three steps can be repeated until the intended language is set.

5.7 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 functioning correctly.

()

Starting with the measurement display (☞ 5.5.2, page 5-11), pressing any key except the MEASURE key will access the MAIN MENU; from here, the following steps are to be followed:
(If the display is showing anything other than the measurement display, pressing the MEASURE key will return to the measurement display).

Note!
If you are unfamiliar with the language set: ☞ page 5-12 shows the sequence to be used to set a different language.

`Setup..`

`Display..`

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

Note!
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.

`Language..`

```
      Language

Language:             EN
```

Set the preferred language for the software; each analyzer shipped with 3 out of below list of available languages.
Currently available (may be extended by future software versions.):
EN: English, **FR**: French, **DE**: German, **IT**: Italian, **ES**: Spanish, **PT**: Portuguese

5.7 Checking the Settings

5.7.1 Installed Options

All X-STREAM gas analyzers can be fitted with a variety of optional components: follow these steps to see which options are installed on your analyzer.

Press the LEFT key several times to return to the SETUP menu.

```
▲InstalledOptions..
Communikation..
Alarms..
▼Save-Load..
```

The cursor is now in the “In/Outputs” line over an arrowhead. Press the DOWN key to display the next menu page and open the INSTALLED OPTIONS submenu.

```
Valves:      Internal
COM-Interf:       Yes
Pump:             Yes
▼Flow monitor:    Yes
```

Page 1

This menu is in two columns and indicates which of the possible optional components are installed in the unit. The values displayed on your unit may differ from those illustrated here.

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.

This initial access to this menu is intended to gain information on the configuration of the unit.

```
▲DigitalIO:         1
Pressure:    Internal
Analog outputs      4
More..
```

Page 2

5.7 Checking the Settings

```
Protocol:   MODB RTU
MODB Mode:     32Bit
ID number:         2
▼Interface: RS485/2w
```

```
▲Baud rate:    19200
Parity:           No
```

In the two pages of the COMMUNICATION menu, you can verify the parameters of the serial interface, and if necessary select the protocol to be used for data transfer.

Pressing the LEFT key twice will return you to the SETUP menu.

5.7.2 Configuring the Display

Press the LEFT key to return to the display setup menu.

```
Setup..
Display..
```

Check the settings for the measurement display, temperature and pressure units, and for menu access: use the DOWN and ETER keys to access the submenus.

If a setting is not in accordance with your requirements, access that menu ad adjust the parameter.

```
▲Line 1:      Comp-1
Line 2:       Comp-2
Line 3:       Comp-3
▼Line 4:      Comp-4
```

Page 2

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

Comp-1 ... Comp-4,
Temp-1 ... Temp-4,
Press-1 ... Press-4,
Flow-1 ... Flow-4
Blank (nothing)

Note*!*
X-STREAM currently supports only one pressure sensor. Values Press-1 to Press-4 thus refer to the same sensor .

```
▲Component..
Temperature..
Pressure..
Gasflow..
```

Page 3

The measurement units for the displayed values can be changed in the submenus on page 3.

For example, here are the options for the display of temperature values:

```
     Temperature
Unit:               °C
DecimalPlaces:       1
Temp-1        63.7 °C
```

Set temperature unit
Options available: **°C, °F**

Set number of decimal places for temperature display: **0 to 4**

Current temperature; here: sensor 1.

5.7.3 Calibration Setup

```
Calibration..
Calibration gases..
```

Once the display settings have been checked, press the LEFT key to return to the SETUP menu, then open the CALIBRATION menu where e.g. the calibration gas concentrations can be entered..

Note!
For more detailed information about the calibration procedure, see ☞ 7.3, page 7-3.

Multi-channel unit:
Select the component to be set in the gas component selection menu.


```
  Calibration gases

ZeroGas:      0.0 ppm
SpanGas:    500.0 ppm
```

In the CALIBRATION GASES menu, the values for zero and span gas should be entered: these values should be taken from the gas supplier's certification. Values must be correctly set for results to be accurate.
In multi-channel units, the values for each channel must be entered separately.

Press the LEFT key to return to the CALIBRATION menu, and check the entry for "Tol. Check".The "Tol.Check" (tolerance check) option is set to inactive (**Off**) by default.
When the tolerance check is active (**10 %**), the analyzer checks during calibration whether the values set for zero and span gas conform to the concentration of the gas currently being supplied. If the concentration varies by more than 10% of the range from the value set, the calibration is aborted.

5.7 Checking the Settings

```
Calibration gases..
Tol.Check:        Off
Hold on Cal:      Yes
▼Purge time:     12 s
```

Page 1

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.

"Hold on Cal": Specifies behaviour of analog outputs and concentration limits alarms during calibrations (follow measured value or not)..
Note!
This parameter may also be set in the menu SETUP - IN-/OUTPUTS - ANALOG OUTPUTS. For more information ☞ page 5-20.

“Purge time”: When gas flow is controlled by internal or external valves, these allow the appropriate calibration gas to flow into the unit as soon as the calibration procedure is started. Due to the limited gas flow and the distance between valves and measuring cell, some time is required before the measuring cell is filled with the calibration gas: this is the purge time, which is to be entered here. If the calibration is started earlier, the gas lines will still contain other components and the calibration will be inaccurate.

Note!
*The line “Purge time” and the second menu page are only displayed if the “Valves” parameter in the INSTALLED OPTIONS menu is not set to **none**.*

"Valve assignment": This line is to assign internal and/or external valves the function of either zero or span gas valve. Instruments with internal valves are already factory setup.

```
▲Valve assignment..
Interval time..
```

Page 2

If any of these parameters need to be changed, ☞ section 7.3 at page 7-3 for more information.

5.7 Checking the Settings

Press the LEFT key to return to the SETUP menu and from there open the MEASUREMENT MENU.

```
Setup..
Measurement..
```

```
Pressure: 1014.0 hPa
Damping..
```

The first line allows the user to enter the current air pressure manually when no pressure sensor is installed, or to read the current pressure when a sensor is installed (☞ INSTALLED OPTIONS menu). The measurement unit is set in the DISPLAY SETUP menu.
If no pressure sensor is installed, enter the current air pressure here and adjust it when significant changes take place: this improves the accuracy of the instrument.

Signal damping (set in the DAMPING menu) allows the smoothing of the measuring signal, but also affects the reactio time of outputs and display. The factory setting is 0 seconds. and any value between 0 and 28 seconds can be set. In multi-channel units, the value for each channel must be entered separately.

5.7.4 Setting the Analog Outputs

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

```
Setup..
In/Outputs..
Analog outputs..
```

```
   Analog outputs

SignalRange:  0-20mA
▼Hold on cal:    Yes
```

Page 1

Page 1 shows settings which are relevant for all available analog outputs:
The “SignalRange” parameter sets the signal range for the analog outputs. This entry also allows the analog outputs to be set according to the NAMUR NE43 recommendations:

The **0-20 mA** operational mode generates a 20 mA signal when the concentration is measured at the upper limit of the signal range. A 0 mA signal is generated when the sample gas concentration is at 0 (dead zero).

However, a severed cable would also result in a signal of 0, and so an external data capture system would not be able to recognise such a failure, instead registering a gas concentration of 0.
The usual method to detect a severed cable is to use an offset current: when the concentration reaches the lower limit of the range, an analog signal of 4 mA is sent. This allows the detection of a severed cable.
This (life zero) mode is activated by setting the “SignalRange” parameter to **4-20 mA**.

5.7 Checking the Settings

Operational modes conforming to NAMUR 43 recommendations (NE 43)

The modes described so far do not generate any signal which would allow the detection of a failure in the measurement system. In such a case, the behaviour of the output signal is undefined: either the last value is held, or a random value is sent. System failures cannot then 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 the "SignalRange" parameter to a value other than **0-20 mA** or **4-20 mA** defines specific analog output signal levels for system failures. Since these values are not sent during normal operation, a data capture system is able to distinguish between the following situations:

- valid measured value (signal within range as per Table 5-1)
- signal out of range (signal slowly rises or falls towards the limits given in table 5-1, and holds that value until the concentration returns to within the measuring range).
- failure (signal out of range as per table 5-1, but not 0)
- severed cable (no signal (0 mA)),

Table 5-1 shows an overview of all available operational modes.

			Output signal, if				
"Signal-Range“	**Operation Mode**	**Failure Signal Level acc. NE 43**	**Measured value is valid**	**Measured value is below lower range limit**	**Measured value is above upper range limit**	**An internal failure occured**	**Cable is broken**
0-20 mA	Dead-Zero	-	0 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
4-20 mA	Live-Zero	-	4 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
0-20 mAL	similar Dead-Zero	below	0 ... 20 mA	-0.2 mA* (-1.8 … -0.01 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	-2 mA	0 mA
4-20 mAL	similar Live-Zero	below	4 ... 20 mA	3.8 mA* (2.2 ...3.9 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	2 mA	0 mA
0-20 mAH	similar Dead-Zero	above	0 ... 20 mA	-0.2 mA* (-1.8 … -0.01 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	> 21.7 mA	0 mA
4-20 mAH	similar Live-Zero	above	4 ... 20 mA	3.8 mA* (2.2 ...3.9 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	> 21.7 mA	0 mA

Note!
*The application of values marked * or ** depends on the setting of "SignalRange"*
*(**☞ Analog outputs menu, page 6-31**).*

Tab. 5-1: Analog Output Signals: Settings and Operational Modes

5.7 Checking the Settings

```
   Analog outputs

SignalRange:  0-20mA
▼Hold on cal:    Yes
```

Page 1

The behaviour of the outputs during calibration can also be set on page 1 of the ANALOG OUTPUTS menu (“Hold on cal” parameter): When the parameter is set to **Yes**, the following occurs during calibration:

- the analog outputs are “frozen”; i.e., the output signals remain constant, irrespective of the actual measured concentrations;
- concentration alarms, which may otherwise be set off by the concentrations of the calibration gases, are supressed.

When **No** is set, the analog output signal always corresponds to the actual measured value during calibration; this may mean that alarms are triggered when limits are exceeded.

Note!
This behaviour may be undesireable if for example the unit is connected to a data capture system.

```
▲Output1..
Output2..
Output3..
Output4..
```

Page 2

The submenus on page 2 allow further analog output parameters to be set. The number of lines displayed will depend on the number of available anaogue outputs. All these submenus are identical:

```
Signal:          Comp-1
LowScale:         0 ppm
HighScale:     1000 ppm
▼Zoom..
```

The “Signal” parameter defines the value to be sent to the selected output. The following options (partly dependent on the number of measuring channels and sensors installed) are available:

Value	Description
None	The analog signal 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 setup in the previous menu in the “SignalRange” line (☞ previous page).
20 mA	A 20 mA signal is generated, with which, for example, the processing of a signal can be tested.
Comp-1, Comp-2, Comp-3, Comp-4	Gas component of channel 1 to 4
Temp-1, Temp-2, Temp-3, Temp-4	Measured value from temperature sensor
Press-1, Press-2, Press-3, Press-4	Measured value from pressure sensor
Flow-1, Flow-2, Flow-3, Flow-4	Measured value from flow sensor
Zoom-C1, Zoom-C2, Zoom-C3, Zoom-C4	A “zoomed” signal is sent from the selected measuring channel (C1 to C4). If one of these options is selected, the “Zoom..” line appears in the menu (see above), which allows a zoom to be set.

5.7 Checking the Settings

```
Signal:          Comp-1
LowScale:         0 ppm
HighScale:     1000 ppm
▼Zoom..
```

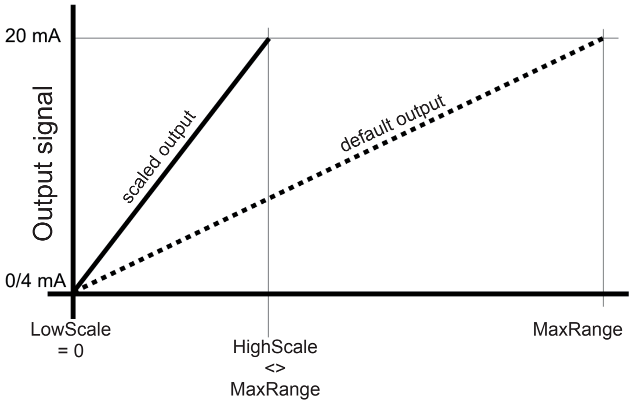
The “LowScale” and “HighScale” parameters allow a concentration value to be set to correspond to the lower (0 or 4 mA) or upper signal value (20 mA). The limis for these parameters are given by the "MinRange" and "MaxRange" parameters, specifying the physical measuring ranges of each instrument (☞ 5.7.4.1, page 5-27).

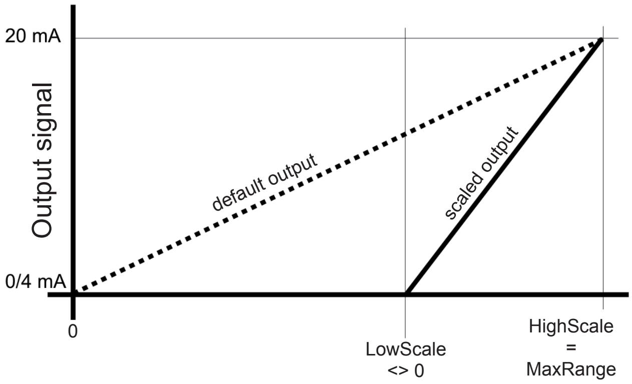
Concentrations outside the range defined by "LowScale" and "HighScale" are not supported by an analog output.

Note!

Scaling may affect the analog outputs accuracy!

Carefully read the information, given in (☞ 5.7.4.1, page 5-27 before scaling analog outputs!

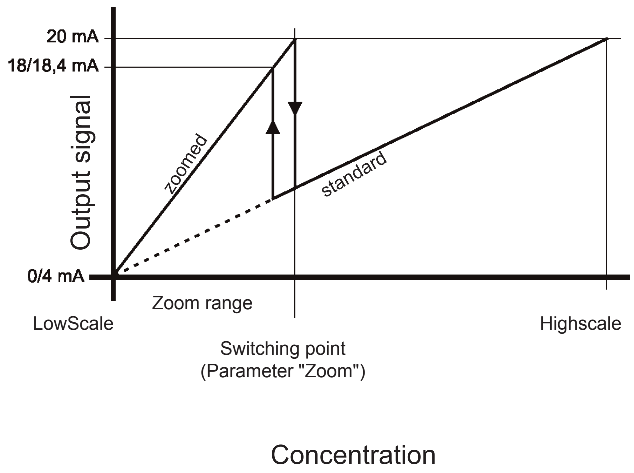




The last line on this menu allows the zoom function of the analog output to be set when that output has been assigned the **Zoom** signal.

This function allows a part of the signal range, specified by “LowScale” and “HighScale”, to be “magnified” on the analog output. Unlike the scaling function, here the output is switched automatically, the moment the switching point concentration is reached.

5.7 Checking the Settings




```
Switching:     Manual
Zoom:            50 %
Position:   LowScale
Status:           Off
```

This allows to increase the resolution (concentration/mA) for a selected range of the entire measuring range.

Note!
Zooming may affect the analog outputs accuracy!
Carefully read the information, given in ☞ 5.7.4.1, page 5-27 before scaling analog outputs!

X-STREAM analyzers support the zooming of analog outputs with the following options:
The zoom function can be activated in different ways; this is set in the “Switching” line:

- **Manual**: The operator must activate the zoom function manually, with either
  - the “Status” parameter in the last line of this menu

  or
  - a parameter in the CONTROL - ZOOM.. menu (☞ 6.2.2.6 page 6-13)
- **Auto**: The analog output is switched depending on the measured concentration.
- **Inputs**: This requires setting a digital input (☞ page 6-39). If an external signal is present at that input, the analog output is switched.

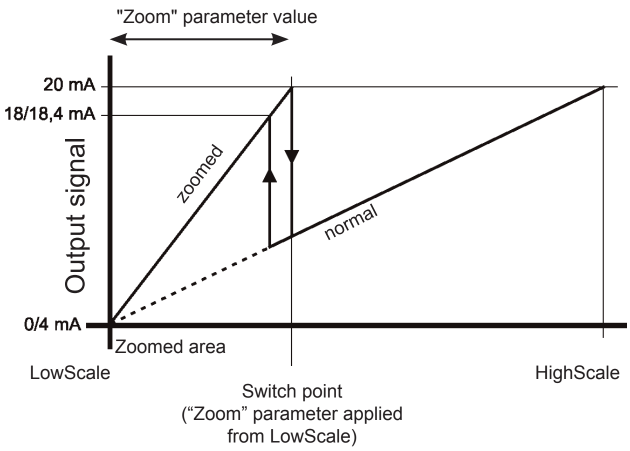
In the second line of the menu the zoomed area can be set to between 1 and 99 % of the range previously set in the “LowScale” and “HighScale” functions.

Additionally, the “Position” parameter allows the X-STREAM analyzer to zoom either the

Note!
For both figures given below, the "Zoom" parameter is set to the same value (here: about 37 %), but, depending on parameter "Position", is once applied from the LowScale end, and once from the HighScale end!

lower or the higher end of the range.

Position: LowScale

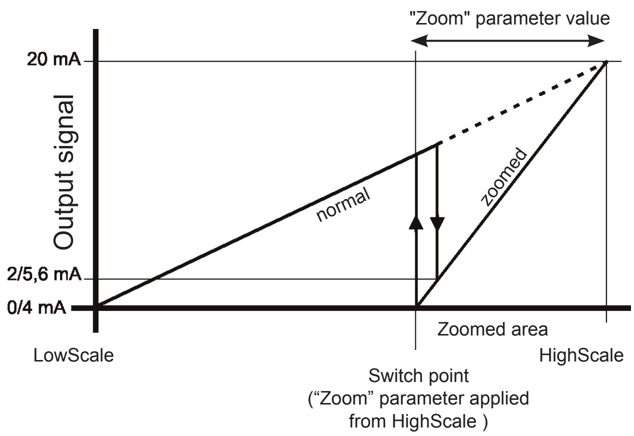


Concentration

If the parameter is set to **LowScale**, the zoomed area is at the lower end of the measurement range.
When switching is set to **automatic**, a hysteresis of 10 % of the output signal range is applied to the switch point:

	Switch point in mA, measured in zoomed area	
Output signal range	rising concentration	falling concentration
0 ... 20 mA	20 mA	18 mA
4 ... 20 mA	20 mA	18.4 mA

Position: HighScale



Concentration

If the parameter is set to **HighScale**, the zoomed area is at the upper end of the measurement range.
When switching is set to **automatic**, a hysteresis of 10 % of the output signal range is applied to the switch point:

	Switch point in mA, measured in zoomed area	
Output signal range	rising concentration	falling concentration
0 ... 20 mA	2 mA	0 mA
4 ... 20 mA	5,6 mA	4 mA

5.7.4.1 References to the Accuracy of the Analog Outputs

Scaling or zooming relates to the analog outputs only and does not affect front panel display nor serial (Modbus) interface output of measuring results!
X-STREAM analyzers are shipped with predefined physical measuring ranges, as listed e.g. in the INFO-RANGES.. menu (parameters „MinRange“ and „MaxRange“):

All specifications like repeatability, drift, etc. (☞ tables 3-7 and 3-8, page 3-18) are related to these physical measuring ranges only! Scaling or zooming cannot improve analog output specifications to values better than specified by the physical measuring ranges!

Furthermore the tables apply only to analog output scaling meeting the form „0 ... MinRange“ to „0... MaxRange“ (means always **0** as "LowScale" value)!
If "LowScale" is set to a value other than **0,** specifications are not longer applicable to **analog outputs**! The same applies to the zoom parameter "Position" (☞ previous page), if set to **HighScale**!

Example
Analyzer data:
MinRange: 500 ppm
MaxRange: 5000 ppm

	Low Scale	***High Scale***	***Statement***
Scaling settings, where tables are applicable	*0*	*500*	*Parameter "LowScale" is **0** and "HighScale" within the limits of "MinRange" and "MaxRange"*
	0	*1000*	
	0	*2375*	
	0	*5000*	
Scaling settings, where tables are NOT applicable	*100*	*500*	*Parameter "LowScale" different **0***
	500	*1000*	
	375	*2500*	
	4000	*5000*	
	0	*300*	*Parameter "HighScale" lower than "MinRange"*
	0	*5100*	*Parameter "HighScale" higher than "MinRange"*

Tab. 5-2: Analog Outputs - Scaling (examples)

5.7.5 Setting Concentration Alarms

Note!
If concentration alarms are not being used,go straight to page 5-34.

Press the LEFT key until the SETUP menu is displayed, then select “Alarms” and open the submenu. If you are using a multi-channel analyzer, select the channel to be modified.

```
Level1:       100 ppm
 Function:        Low
Level2:       500 ppm
 Function:       High
```

Two concentration limits can be set for each channel. Valid settings for limit levels depend on the measuring range and the value of the “SpanRange” parameter (☞ next page): An error message is displayed if an invalid setting is input.

Should the measured concentration go beyond one of the limits, a message is displayed in the fourth line of the measurement display and the corresponding digital output is activated if programmed to do so.

5.7 Checking the Settings

The “SpanRange” parameter is displayed in the INFO - RANGE menu (☞ 6.2.5.1, page 6-62) and is always given as the percentage of the upper range limit of the selected channel. The “SpanRange” parameter is preset and cannot be modified by the operator. It is used for various functions:

Firstly, this parameter determines the **maximum possible value of the span gas**:

A SpanRange of e.g. 220 % means that the greatest permitted value of the span gas for the selected channel is 220 % of the maximum measuring range.

Example 1:

The oxygen measuring range is 10 %. If the SpanRange is set to 220 %, the maximum permissable span gas concentration is 22 %, enabling to use ambient air (21 % O_2) as a span gas.

Furthermore, the “SpanRange” parameter determines the **range for concentration limits**. 100 percentage points are subtracted from the value of this parameter: The result determines by how much above or below the measuring range limits may be set.

Example 2:

Range upper limit: 1000 ppm,

SpanRange: 100 %.

This means that the span gas range coincides with the measuring range. Limits may not lie outside this range: only limits betweeb 0 ppm and 1000 ppm are admissable.

Example 4:

Range upper limit: 1000 ppm,

SpanRange: 110 %.

This means that the span gas range exceeds the upper measuring range limit by 10 %. The lower limit may therefore be 10 % below the lower range limit: limits of between -100 ppm and +1100 ppm are admissable.

Example 4:

Range upper limit: 1000 ppm,

SpanRange: 220 %.

This means that the span gas range exceeds the measuring range by 120 % in both directions (220 % - 100 % = 120 %): the limits may be set between -1200 ppm (-120 % of 1000 ppm) and +2200 ppm (+220 % of 1000 ppm).

	Range: 0 ... 1000 ppm				
	Parameter "Span range"	**Span range exceeds measuring range by**		**Permissible concentration limits**	
		relative value	**absolute value**	**lower limit**	**upper limit**
Example 2 (see text)	100 %	0 %	0 ppm	0 ppm	1000 ppm
Example 3 (see text)	110 %	10 %	100 ppm	-100 ppm	1100 ppm
Example 4 (see text)	220 %	120 %	1200 ppm	-1200 ppm	2200 ppm

Tab. 5-3: Influence of “SpanRange” Parameter on Concentration Alarm Limits

5.7 Checking the Settings

The function of each limit can be set in the “Function” parameter:

Low: An alarm is triggered if the measured value drops below the set limit.
The alarm relay is activated.

High: An alarm is triggered if the measured value exceeds the set limit.
The alarm relay is activated.

Off: The alarm function is deactivated and the corresponding relay is not activated (remains dead).

The “Function” parameter also supports the “Failsafe” operational mode:

Fail**s**afe (**FS**) means that the alarm relay is activated during **normal operation**. This is the reverse of the usual function in which a relay is activated when an alarm is triggered. In FS mode, if an alarm is triggered, the relay is switched off. In this way, an alarm is also triggered if, for example, the analyzer loses power. Cable breaks can also be detected in this way. Options are:

Low FS: An alarm is triggered if the measured value drops below the set limit.
The alarm relay is deactivated.

High FS: An alarm is triggered if the measured value exceeds the set limit.
The alarm relay is deactivated.

Off FS: The alarm function is deactivated and the corresponding relay is activated.

Various different behaviours can be programmed using combinations of operational modes and limit settings:

- Window mode: An alarm is triggered, if the concentration drops below or exceeds the limits of a concentration window, .
- High pre-alarm and main alarm: A pre-alarm and a main alarm are set for rising concentrations.
- Low pre-alarm and main alarm: A pre-alarm and a main alarm are set for falling concentraions.

For more detailed information on alarm settings, please see the following instructions and illustrations.

Note!
***Off FS** is preset by default unless otherwise specified on time of order.*

5.7 Checking the Settings

- **Defining a window**

If a window between an upper and a lower limit is defined (fig. 5-2), an alarm is issued when the concentration exceeds the upper level (area D) or drops below the lower limit (area B).

Only one alarm can be active per channel at any one time.

Standard mode:
An alarm results in the assigned relay being activated.
Settings:
- Level 1 > Level 2
- Level 1-Function: High
- Level 2-Function: Low

Failsafe mode:
An alarm results in the assigned relay being deactivated.
Settings:
- Level 1 > Level 2
- Level 1-Function: High FS
- Level 2-Function: Low FS

If an alarm is active, a corresponding message is displayed in line 4 of the measurement display.

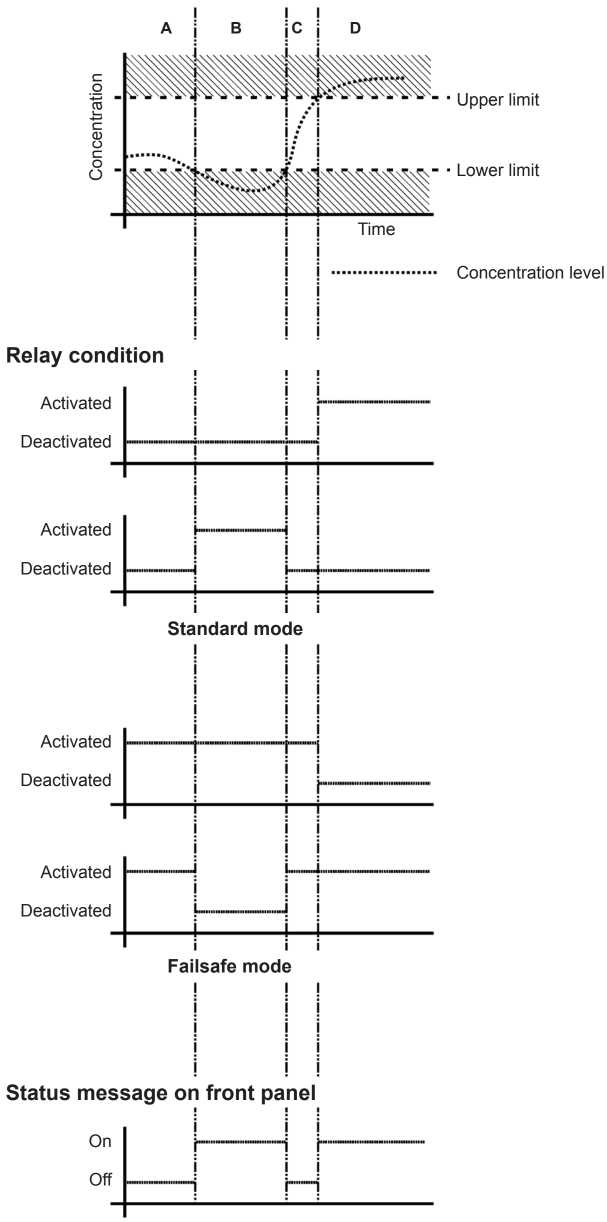


Fig. 5-2: Limits Defining a Window for valid Concentrations

5.7 Checking the Settings

- **Defining high pre-alarm and main alarm**

If two upper limits are set with one limit higher than the other (fig. 5-3), a pre-alarm is triggered when the measured concentration exceeds the first limit (area B). If no corrrective measures are taken and the concentration exceeds the second limit (area C), a main alarm is triggered.

Up to two alarms may be active per channel at any one time.

Standard mode:
An alarm results in the assigned relay being activated.
Settings:
- Level 1 > Level 2
- Level 1-Function: High
- Level 2-Function: High

Failsafe mode:
An alarm results in the assigned relay being deactivated.
Settings:
- Level 1 > Level 2
- Level 1-Function: High FS
- Level 2-Function: High FS

If an alarm is active, a corresponding message is displayed in line 4 of the measurement display.

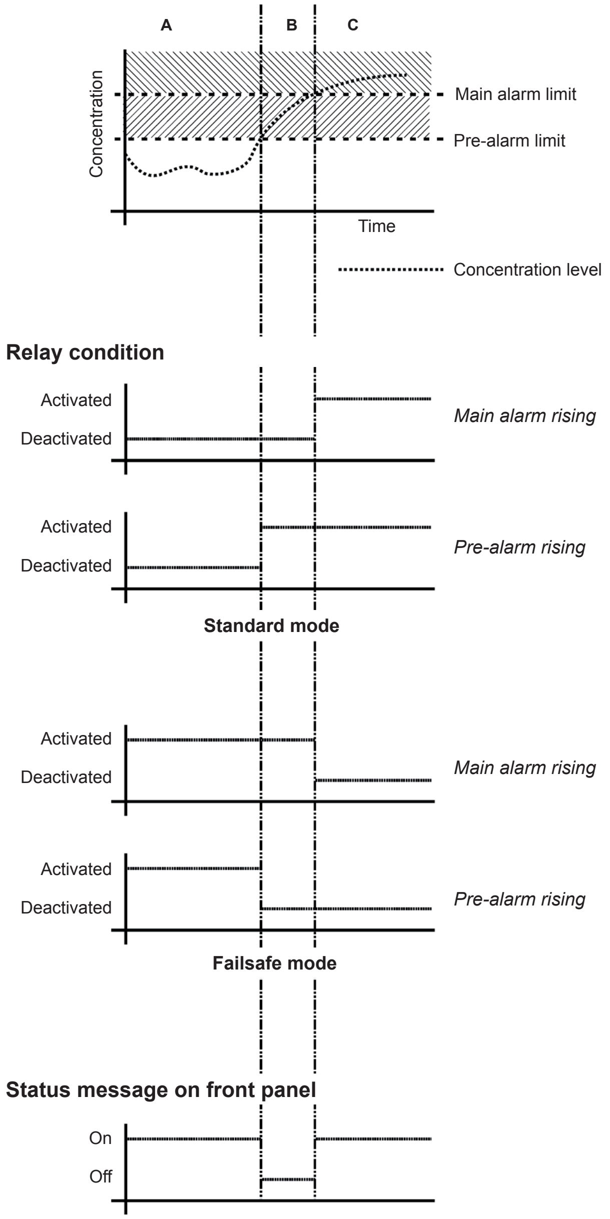


Fig. 5-3: High Pre-Alarm and Main Alarm

5.7 Checking the Settings

- **Defining low pre-alarm and main alarm**

If two lower limits are set with one limit lower than the other (fig. 5-4), a pre-alarm is triggered when the measured concentration falls below the first limit (area B). If no corrective measures are taken and the concentration falls below the second level (area C), a main alarm is triggered.

Up to two alarms may be active per channel at any one time.

Standard mode:
An alarm results in the assigned relay being activated.
Settings:
- Level 1 > Level 2
- Level 1-Function: Low
- Level 2-Function: Low

Failsafe mode:
An alarm results in the assigned relay being deactivated.
Settings:
- Level 1 > Level 2
- Level 1-Function: Low FS
- Level 2-Function: Low FS

If an alarm is active, a corresponding message is displayed in line 4 of the measurement display.

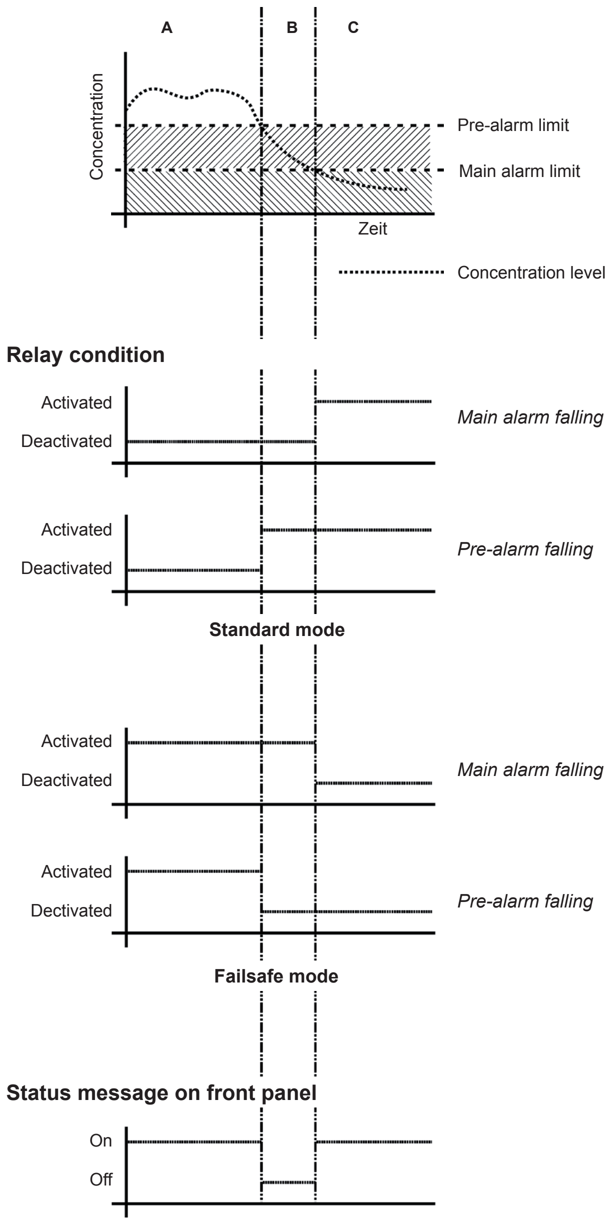


Fig. 5-4: Low Pre-Alarm and Main Alarm

5.7.6 Backing Up the Settings

The most important parameters have now been checked and the unit's settings adjusted to your needs.
A backup copy of these configuration data can now be made and saved.

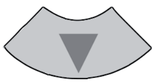
Press the LEFT key until the SETUP menu is displayed, and from there open the SAVE-LOAD menu.

```
▲Installed options..
Communication..
Alarms..
Save-Load..
```

Page 2

```
      Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

Page 1



Press the DOWN key to reach page 2.

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

Page 2

Now select the "CfgData > UserData" line and press ENTER.

5.7 Checking the Settings

```
  CfgData>UserData
  Are you sure?
No!
Yes!
```

A new window comes up to confirm the action: Select the line **Yes!** and press the ENTER key: Another windows shows the current status.

```
   Copying data
  - PLEASE WAIT -

Procedure     X:E000
```

The unit is now saving a copy of the current configuration data (the so-called **CfgData** dataset) in a special area of memory labelled **UserData**. This dataset can be used to reset the unit later if, for example, later incorrect settings render the unit unusable.

If, during the analyzer startup up, the **CfgData** checksum is found to be incorrect, the **UserData** dataset is loaded, to ensure the instrument remains usable.

Further changes to the configuration will only be stored in the **CfgData** dataset until manually saved to **UserData**.

```
        (i)

 -COMMAND EXECUTED-
```

Upon completion of the saving process a confirmation message will be displayed.

Note!
For more detailed descriptions of all the operations in this menu: *☞ 7.6, page 7-51.*

You have now completed checking the analyzer setup: Press the MEASURE key to return to the measurement display.

Chapter 6
User Interface and Software Menus

This chapter describes the structure and contents of the X-STREAM X2 gas analyzer software menus.

While all the software menues are described in this chapter, chapters 5 and 7 explain by use of examples how to navigate through the menus to perform certain basic setup operations or other functions.

6.1 Symbols used

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

Symbols used in this section

Symbol	Description
Within Process Descriptions	
Setup..	Menu title
Setup.. Analog outputs..	Upper level (*Setup*) and current menu (*Analog outputs*)
Analog outputs.. Output1 *(2...4)*	The menu illustrated here for Output1 is the same as for Output2 through Output4
Zero calibration.. Span calibration.. Adv. calibration.. ▼Apply gas..	Display ***Note!*** *Menus or lines on grey background are optional or dependent on context, and so may not always be displayed.*
	Menu access:
	Level 1 *(User)*
	Level 2 *(Expert)*
	Level 3 *(Administrator)*
	Level 4 *(Service level)*

Others

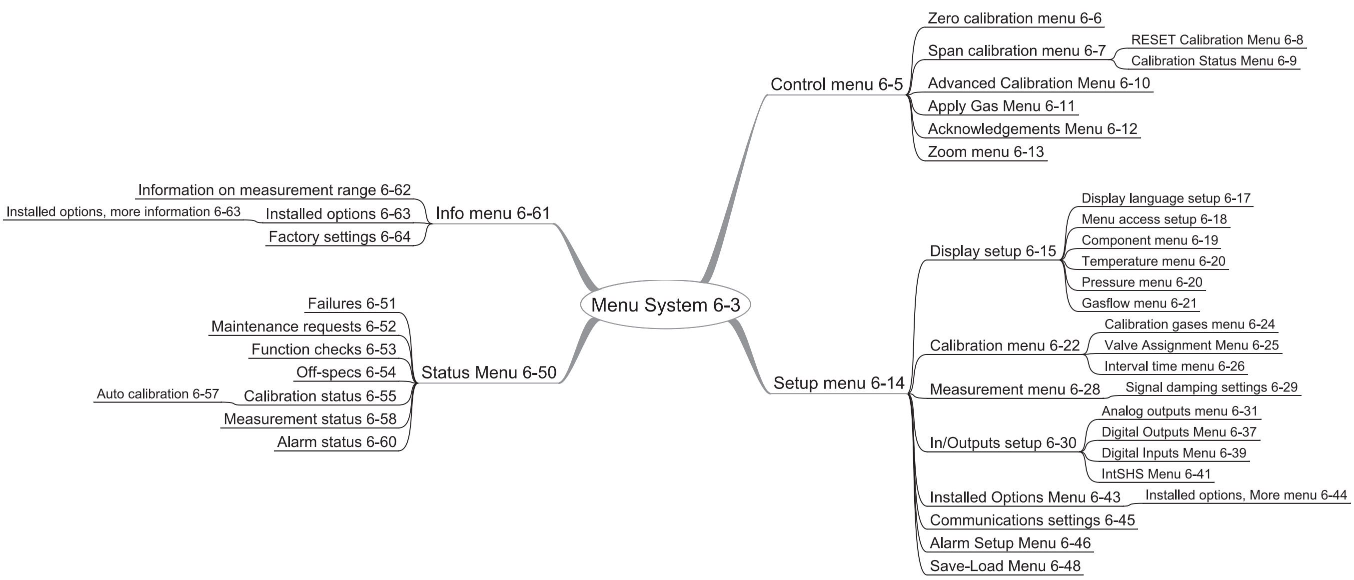
Convention	Description
Within Text	
(MENU TITLE) ☞ 6.2.2, page 6-12	For a detailed description of the *Menu*, see section 6.2.2 on page 6-12.
CONTROL.. - ZOOM..	From within the CONTROL menu select the ZOOM menu.
"Valves"	Parameter name
Never, 1 min	Values to be selected
0 ... 2000	Value to be entered

6.2 Menu System

Note!

This overview does only show menu branches up to the 3rd menu level, not functions nor parameter lines! E.g. the line "Pump" of CONTROL is not shown.

The analyzer´s menu system has a dynamic behavior in that it does not show entries not supported by the current analyzer configuration. Therefore this overview might show entries hidden in your specific instrument!



Notes!
This figure applies to software revision 1.x and later. Numbers are page numbers of this manual, where the associated menu is explained.

Fig. 6-1: *X-STREAM Software menu structure*

6.2 Menu System

6.2.1 Startup

```
CO2.1        135.1 ppm
O2.2        201952 ppm
Temp-1        58.8 °C
   (Messages)
```

Measurement Display

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

Pressing any key (except MEASURE) will switch to the main menu.

The following submenus are available from here:

```
Control..
Setup..
Status..
Info..
```

MAIN Menu

- Control menu ☞ 6.2.2, page 6-5
- Setup menu ☞ 6.2.3, page 6-14
- Status menu ☞ 6.2.4, page 6-50
- Info menu ☞ 6.2.5, page 6-61

6.2 Menu System - Control menu

6.2.2 Control menu

```
Control..
```

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

```
Zero calibration..
Span calibration..
Adv. calibration..
▼Apply gas..
```

Page 1

Zero calibration menu
☞ 6.2.2.1, page 6-6

Span calibration menu
☞ 6.2.2.2, page 6-7

Advanced calibration menu
☞ 6.2.2.3, page 6-10

Apply gas menu
☞ 6.2.2.4, page 6-11

Note!

Internal or internal valves must be installed for the last two lines to appear (☞ 6.2.3.4.4, page 6-39)

```
▲Lock menus!
Acknowledgements..
Pump:            Off
Zoom..
```

Page 2

Pressing the ↵ key in this line will lock all menus for which the code parameter in the menu access settings has been set to **On** or **1 Min** (☞ 6.2.3.1.2, page 6-18)

Acknowledgements submenu
☞ 6.2.2.5, page 6-12

Available when internal pump installed:
Switch internal pump **On** or **Off**.

Note!

This line does not appear when a digital input is used to control the pump (☞ 6.2.3.4.4, page 6-39) *or when no internal pump is available.*

Zoom submenu
☞ 6.2.2.6, page 6-13

Note!

The zoom function for at least 1 analog output must be activated for this line to appear (☞ 6.2.3.4.1, page 6-31).

Software Menus
6

6.2.2.1 Zero calibration menu

```
Control..
Zero calibration..
```

Component ?

Multi-channel unit:
Select the channel to be calibrated in the SELECT COMPONENT menu.

```
Cancel calibration!
Start calibration!
Zero gas      0.0 ppm
▼CO2.1      134.1 ppm
```

Page 1

Pressing the ↵ key in this line will abort the zero calibration and cancel any changes.

Pressing the ↵ key in this line will start the zero calibration.

Current nominal zero gas concentration (zero gas concentration can be set in the SETUP menu ☞ 6.2.3.2.1, page 6-24)

Current measured gas concentration.

```
▲RESET..
Status..

CO2.1       134.1 ppm
```

Page 2

Press the ↵ key in this line to enter a submenu to reset the calibration parameters (☞ 6.2.2.2.1, page 6-8)

Press the ↵ key in this line to view the current calibration status (☞ 6.2.2.2.2, page 6-9)

Current measured gas concentration.

Note!
For further details on calibration procedures, see ☞ chapter 7 Maintenance.

Multi-channel unit:
Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.2.2 Span calibration menu

```
Control..
Span calibration..
```

Component ?

Multi-channel unit:
Select the channel to be calibrated in the SELECT COMPONENT menu.

```
Cancel calibration!
Start calibration!
Span gas  2000.0 ppm
▼CO2.1     134.1 ppm
```

Page 1

Pressing the ↵ key in this line will abort the span calibration and cancel any changes.

Pressing the ↵ key in this line will start the span calibration.

Current nominal span gas concentration (span gas concentration can be set in the SETUP menu ☞ 6.2.3.2.1, page 6-24)

Current measured gas concentration.

```
▲RESET..
Status..

CO2.1      134.1 ppm
```

Page 2

Press the ↵ key in this line to enter a submenu to reset the calibration parameters (☞ 6.2.2.2.1, page 6-8)

Press the ↵ key in this line to view the current calibration status (☞ 6.2.2.2.2, page 6-9)

Current measured gas concentration.

Note!
For further details on calibration procedures, see ☞ chapter 7 Maintenance.

Multi-channel unit:
Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.2.2.1 RESET Calibration Menu

```
      RESET
   Are you sure?
No!
Yes!
```

This menu appears if the user selected the menu line "Reset.." in either the ZERO CALIBRATION or SPAN CALIBRATION menu.

To reset the current calibration data to the values saved in UserData (6.2.3.8 SAVE-LOAD menu on page 6-48), select "*Yes!*" and press the ↵ key.

"*No!*" returns to the previous menu without applying changes to the calibration data.

Note!

Unless altered by the user, UserData settings are the same as the factory settings.

Note 2!

Once the reset procedure is started, a message is displayed indicating how to abort the procedure.

6.2.2.2.2 Calibration Status Menu

The calibration status menu is accessible from the ZERO CALIBRATION (☞ 6.2.2.1, page 6-6) and SPAN CALIBRATION (☞ 6.2.2.2, page 6-7) menus and is for information purpose only.

```
Gasflow       Spangas
CO.1      13.304 ppm
Procedure       None
Time             0 s
```

The first line indicates the currently used gas.

This line shows the concentration currently measured.

Indicates which procedure is active (**None**, **Purging**, **Zeroing, Spaning**).

Time remaining for completion of active procedure.

6.2.2.3 Advanced Calibration Menu

```
Control..
Adv. calibration..
```

Note!
*This menu is only available when the "Valves" parameter in the INSTALLED OPTIONS Menu is set to a parameter other than **none**.*

```
Cancel calibration!
ZeroAll!
SpanAll!
ZSCalAll!
```

Pressing the ↵ key in this line will abort the current calibration procedure and cancel any changes.

Pressing the ↵ key in this line will start the zero calibration for all channels.

Pressing the ↵ key in this line will start the span calibration for all channels.

Pressing the ↵ key in this line will start the zero & span calibrations for all channels.

Note!
*This menu is also available in single-channel units. In this case, the 2nd and 3rd lines will start a zero or span calibration, while the 4th line will allow the operator to start a zero **and** a span calibration with a single keypress.*

Note!
For further details on calibration procedures, see ☞ chapter 7 Maintenance.

6.2.2.4 Apply Gas Menu

```
Control..
Apply gas..
```

Note!
This menu is only available when the "Valves" parameter in the INSTALLED OPTIONS menu is set to a parameter other than ***none****.*

Component ?

Multi-channel unit:
Select the component to be set in the SELECT COMPONENT menu.

```
Apply gas:    Sample

CO2.1      134.1 ppm
Time             0 s
```

Use the ↑ and ↓ keys to switch between **Sample**, **Zero**, **Span** and **None**.

When the selected value is confirmed with the ↵key, the corresponding valve will be opened and all others closed (with the exception of **None**, which closes all valves).

Multi-channel unit:
Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.2.5 Acknowledgements Menu

```
Control..
Acknowledgements..
```

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

```
 Acknowledgements

Status!
```

All status messages are acknowledged and reset here: simlpy press the ↵ key, to acknowledge messages.

```
        (i)

 -COMMAND EXECUTED-
```

A short confirmation is displayed after this procedure.

6.2.2.6 zoom menu

```
Control..
Zoom..
```

This menu allows the operator to determine which analog outputs are "zoomed”, if any:

Off: Output is not zoomed.

On: Output is zoomed.

```
Zoom1:          On
Zoom2:         Off
Zoom3:         Off
Zoom4:         Off
```

Setting for output 1

Setting for output 2

Setting for output 3

Setting for output 4

Note!

These settings merely switch the zoom function for each channel on or off.

To edit the zoom function settings (e.g. zoom factor, etc.), use the corresponding menu for analog output settings (☞ 6.2.3.4.1.2.1, page 6-36).

6.2.3 Setup menu

```
Setup..
```

```
Display..
Calibration..
Measurement..
▼In/Outputs..
```

Page 1

Display setup
☛ 6.2.3.1, page 6-15

Calibration setup
☛ 6.2.3.2, page 6-22

Measurement setup
☛ 6.2.3.3, page 6-28

In/Output setup
☛ 6.2.3.4, page 6-30

```
▲Installed options.
Communication..
Alarms..
Save-Load..
```

Page 2

Installed options
☛ 6.2.3.5, page 6-43

Communication setup
☛ 6.2.3.6, page 6-45

Alarms setup
☛ 6.2.3.7, Seite 6-46

Save-Load
☛ 6.2.3.8, Seite 6-48

6.2.3.1 Display setup

```
Setup..
Display..
```

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

```
Auto-Home:      Never
Language..
Menu access..
▼
```

Page 1

This parameter determines how long the software waits without user activity before switching to the measurement display. Available options:

Never, 1 min, 10 min

Display language options 
☞ 6.2.3.1.1, page 6-17

Menu access settings 
☞ 6.2.3.1.2, page 6-18

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

```
▲Line 1:        Comp-1
Line 2:         Comp-2
Line 3:         Comp-3
▼Line 4:        Comp-4
```

Page 2

Selection of measurement values to be displayed in each line of the measurement display. Available options:

Comp-1 ... Comp-4,
Temp-1 ... Temp-4,
Press-1 ... Press-4,
Flow-1 ... Flow-4
Blank (nothing)

Note!
*X-STREAM currently only supports one pressure sensor. The values **Press-1...Press-4** therefore all relate to the same sensor.*

6.2 Menu System - Display setup menu

```
▲Component..
Temperature..
Pressure..
▼Gasflow...
```

Page 3

Component display setup
☞ 6.2.3.1.3, Page 6-19

Temperature display setup
☞ 6.2.3.1.4, Page 6-20

Pressure display setup
☞ 6.2.3.1.5, Page 6-20

Gasflow display setup
☞ 6.2.3.1.6, Page 6-21

Beginning with rev. 1.1, X-STREAM X2 supports 2 measurement display pages, to show additional measuring results. To configure this 2nd page, enter menu page 4 of the current menu.

```
▲Line 5:      Comp-1
Line 6:       Comp-2
Line 7:       Comp-3
Line 8:       Comp-4
```

Page 4

Selection of measurement values to be displayed in each line of the measurement display. Available options:

Comp-1 ... Comp-4,
Temp-1 ... Temp-4,
Press-1 ... Press-4,
Flow-1 ... Flow-4
Blank (nothing)

Note!

*X-STREAM currently only supports one pressure sensor. The values **Press-1...Press-4** therefore all relate to the same sensor.*

Note!

If a 2nd measurement display page has been configured, use the LEFT/RIGHT keys to switch between both pages.

6.2.3.1.1 Display language setup

```
Setup..
Display..
Language..
```

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

```
      Language

Language:         EN
```

Selects the preferred language for the analyzer software. Available options may vary according to the software version.

Currently available:

EN: English,

FR: French

DE: German

IT: Italian

ES: Spanish

PT: Portuguese

PL: Polish

Note!

Each analyzer is shipped with 3 out of above listed available languages. This list may be extended by future software versions.:

6.2.3.1.2 Menu access setup

```
Setup..
Display..
Menu access..
```

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

```
Code 1:        Off
Code 2:        Off
Code 3:        Off
▼Activate      On ⌂
```

Page 1

Lines 1 to 3 determine whether the corresponding access level is locked:

Off: Menu access not locked.

On: Access code must be entered to gain access to the corresponding menus (code 3 = level 3, ..).

Note!

*If a lower level is **locked**, all higher levels will also be **locked**.*

*If a higher level is **unlocked**, all lower levels will also be **unlocked.***

Determines how unlocked menus are re-locked to restore security settings.

Available options:

On ⌂: all levels with active security code are locked on return to the measurement display

1 min: Levels are locked after 1 minute of inactivity.

Never: Menus remain unlocked.

Note!

Executing the "Lock menus!" function in the CONTROL menu (☞ 6.2.2, pg. 6-5), sets all active locks.

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

```
▲
Code 1:     00000001
Code 2:     00000002
Code 3:     00000003
```

Page 2

Defines access codes for the corresponding levels.

The illustration shows the factory settings.

6.2.3.1.3 Component menu

```
Setup..
Display..
Component..
```

Component ?

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
     Component
Tag:              CO2.1
DecimalPlaces:        1
▼CO2.1      134.1 ppm
```

Page 1

The tag for the gas component is entered here: each character must be selected and set separately.

Note!

The “1” in this example indicates that CO_2 is the first measurement channel (may be useful for multi-channel units, but not necessary).

Set number of places after the decimal point: **0** to **4**

Current sample gas concentration using settings described above. Display format is refreshed immediately.

```
▲         Unit
Text:               ppm
Factor:          1.0000
Offset:          0.0000
```

Page 2

Set text for the measuring unit of the gas component: each character must be selected and set separately.

Gas concentrations are internally calculated in ppm. To use other units, the corresponding factor must be entered, e.g. 0.0001 for %.

If necessary, an offset to be added to the measured value can be set here.

Note!

Texts for tags and units, and values for factor and offset are not checked for plausibility. Any arbitrary value can be set..

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.3.1.4 Temperature menu

```
Setup..
Display..
Temperature..
```

```
    Temperature
Unit:               °C
DecimalPlaces:       1
Temp-1       63.7 °C
```

Set temperature unit
Available options: **°C, °F**

Set number of places after decimal point for temperature value: **0 to 4**

Current temperature, here: Sensor 1 value

6.2.3.1.5 Pressure menu

```
Setup..
Display..
Pressure..
```

```
     Pressure
Unit:              hPa
DecimalPlaces:       1
Pressure   998.1 hPa
```

Set pressure value
Available options:
Pa, hPa, mbar, Bar, psi

Set number of places after decimal point for pressure value: **0 to 4**

Current presssure value

6.2.3.1.6 Gasflow menu

```
Setup..
Display..
Gasflow..
```

```
       Gasflow
Unit:                l/h
DecimalPlaces:         1
Flow-1        63.7 l/h
```

Set gas flow unit
Available options: **l/h, l/min, mlmin**

Set number of places after decimal point for gas flow value: **0 to 4**

Current gas flow, here: Sensor 1 value

6.2.3.2 Calibration menu

```
Setup..
Calibration..
```

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

```
Calibration gases..
Tol.Check:        Aus
Hold on Cal:      Yes
▼Purge time:     12 s
```

Page 1

Sets calibration gas concentrations ☞ 6.2.3.2.1, page 6-24

This parameter determines whether the tolerance check is active during calibration. Available options:

10%: Tolerance check is active, the limit is set to 10% (not changeable). A system message must be manually acknowledged (☞ 6.2.2.5, page 6-12)

AutoClr: As **10 %**, except that a system message is automatically acknowledged after 2 or 3 minutes.

Off: Tolerance check is deactivated

Specifies analog outputs behaviour during calibrations. Available options:

Yes: analog outputs are “frozen” & concentration alarms are surpressed

No: the analog outputs follow the concentration. This may cause trouble if connected to a data acquisition system.

Note!

*The following lines are only available when the “Valves” parameter in the INSTALLED OPTIONS”menu is set to a parameter other than **none**.*

The time required when switching to zero or span gas so that the gas lines are completely filled with the new gas is entered here.

Possible values: **0 .. 600** seconds

Note!

For further details on calibration procedures, see ☞ chapter 7 Maintenance.

6.2 Menu system - Calibration setup

Note!
*This second page is available only if the parameter "valves" in the INSTALLED OPTIONS menu is set to other than **none**.*

```
▲Valve assignment..
Interval time..
```

Page 2

Assign valves
☞ 6.2.3.2.2, page 6-26

Set interval time for calibration
☞ 6.2.3.2.3, page 6-26

6.2.3.2.1 Calibration gases menu

```
Setup..
Calibration..
Calibration gases..
```

Component ?

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
 Calibration gases

ZeroGas:      0.0 ppm
SpanGas:    500.0 ppm
```

The concentration of the zero gas used for calibration is entered here.

The concentration of the span gas used for calibration is entered here.

***Note*!**

Units for calibration gas concentrations are take from the corresponding entry in the display setup menu.

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.3.2.2 Valve Assignment Menu

```
Setup..
In/Output..
Valve assignment..
```

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

Component ?

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
  Valve assignment

Zerogas:            V1
Spangas:            V2
```

The internal and/or external valves are assigned to zero or span gas in this menu (☞ "7.3 Calibration Procedures" at page 7-5).

Available options:

V1 ... V8

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

Note for multi-channel units:

Valves can be freely assigned to channels. This includes among others the following variations:

- *identical combinations (of zero and span gas valves) for several channels*
- *Combinations in which one valve has the same function for several channels*
- *Combinations in which one valve has a different function depending on the channel; e.g. a zero gas valve for channel 1 is also the span gas valve for channel 2.*

Depending on the gases use, the calibration procedure can be optimised for time or efficiency using such combinations.

(☞ "7.3 Calibration Procedures" at page 7-5).

6.2.3.2.3 Interval time menu

```
Setup..
Calibration..
Interval time..
```

Note!
*The following lines are only available when the “Valves” parameter in the INSTALLED OPTIONS menu is set to a value other than **none**.*

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

```
   Interval time
ZeroAll:        2 h
ZSCalAll:      10 h
AutoCal in..
```

ZeroAll: Sets the time between two zero calibrations in autocal mode.

ZSCalAll: Sets the time between two combined zero & span calibrations in autocal mode.

Possible values for both parameters:
0 .. 999 h

AutoCal in..: Specify a time interval to elapse from the current time until the first autocal starts
☞ 6.2.3.2.3.1, page 6-27

Note!
This line appears if at least one interval time has been set.

Note!
For further details on calibration procedures, see ☞ chapter 7 Maintenance.

6.2.3.2.3.1 6.2.3.2.3.1 AutoCal in menu

```
Setup..
Calibration..
Interval time..
AutoCal in..
```

Note!
This menu appears only, if at least one interval time has been set.

```
ZeroAll:          1 h
ZeroAll:     15 min
ZSCalAll:         1 h
ZSCalAll:    15 min
```

The first two lines allow to enter a time to elapse from the current moment, before the next zero calibration for all channels is started. Preset is the remaining time until the next zero calibration starts.

Possible values: **Any value up to the preset time interval.**

Lines 3 & 4 allow to enter similar data for a combined zero & span calibration.

Possible values: **Any value up to the preset time interval.**

Note!
In case there is an interval time specified for one procedure only (ZeroAll or ZSCalAll; ☞ 6.2.3.2.3, page 6-26), the related lines for the other procedure will be hidden in this menu!.

6.2.3.3 Measurement menu

```
Setup..
Measurement..
```

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

```
Pressure: 1014.0 hPa
Damping..
```

If no pressure sensor is installed (INSTALLED OPTIONS - PRESSURE.. set to **Manual**), the current ambient pressure must be set here.

Possible values: **500 .. 2000** hPa

Otherwise this line is not editable and shows the currently measured pressure.

Note 1

The unit for pressure values is taken from the relevant entry in the display setup.

Note 2

*As the pressure value is used for pressure compensation, it should, when set to **Manual,** be regularly updated to ensure accurate results.*

Setup signal damping

☞ 6.2.3.3.1, page 6-29

6.2 Menu System - Measurement setup

6.2.3.3.1 Signal damping settings

```
Setup..
Measurement..
Damping..
```

Component ?

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
Damping:          5 s
```

The time for the electronic signal damping is entered here.

Lower values give results which are updated more quickly, higher values supress noise from varying gas concentrations.

Possible values: **0 .. 28** seconds

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel..

Note!

The analyzer's total delay time (t_{90} time) is the sum of the signal damping time and the physical time lag caused e.g. by the properties of the gas flow and the sensors.

6.2.3.4 In/Outputs setup

```
Setup..
In/Outputs..
```

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

```
Analog outputs..
DigitalOutputs..
DigitalInputs..
IntSHS..
```

Analog outputs menu
☞ 6.2.3.4.1, page 6-31

Digital outputs menu
☞ 6.2.3.4.2, page 6-37

Digital inputs menu
☞ 6.2.3.4.3, page 6-39

Note!
*This menu line appears only when the parameter in the INSTALLED OPTIONS - DIGITAL IO menu is set to **1** or **1+2*** (☞ 6.2.3.5,page 6-43)

IntSHS menu
☞ 6.2.3.4.4, page 6-39

Note!
*This menu line appears only if the parameter in the INSTALLED OPTIONS - VALVES menu is set to **Internal** or **Int+Ext*** (☞ 6.2.3.5, page 6-43

6.2.3.4.1 Analog outputs menu

```
Setup..
In/Outputs..
Analog Outputs..
```

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

```
   Analog outputs

SignalRange:  0-20mA
▼Hold on cal:     No
```

Page 1

This line sets the output signal range for all outputs.

Available options:

0-20mA, 4-20mA, 0-20mAL, 4-20mAL, 0-20mAH, 4-20mAH

☞ 6.2.3.4.1.1, page 6-33

This entry determines whether the analog output signal and concentration alarm status are held during calibration.

When **Yes** is set, then during calibration:

- analog outputs are “frozen”; i.e., the analog signals remain constant irrespective of the actual measured concentration.
- concentration alarms, which would otherwise be triggered by the calibration gas concentrations, are surpressed.

When **No** is set, the analog output signal at any given moment reflects the actual measured value during calibration; this may trigger alarms when set limits are exceeded or underrun.

***Note*!**

This behaviour may be problematic if, for example, the instrument is connected to a data acquisition system.

6.2 Menu System - Analog outputs menu

```
▲Output1..
Output2..
Output3..
▼Output4..
```

Page 2

Available analog outputs (min. 1, max. 4) can be set in greater detail via these submenus.
☞ 6.2.3.4.1.2, page 6-34

```
▲
Cut mode:   Standard
Low cut:        3.80
High cut:      20.50
```

Page 3

The lines on this page enable to configure the behaviour of the analog outputs in case the measured values are beyond the range limits:

Options:

Standard: The outputs are set to the values marked * in table 6-1 below

Config: The outputs can be adjusted to the values marked ** in table 6-1 below.

These two lines are editable only, if "Cut mode" is set to **Config**:

Low Cut: Configure the "below lower range limit" output signal

High Cut: Configure the "above upper range limit" output signal

Accepted values depend on the setting of "SignalRange" and are marked ** in table 6-1.

Note!

These settings apply to ALL analog outputs!

			Output signal, if				
"Signal-Range"	**Operation Mode**	**Failure Signal Level acc. NE 43**	**Measured value is valid**	**Measured value is below lower range limit**	**Measured value is above upper range limit**	**An internal failure occured**	**Cable is broken**
0-20 mA	Dead-Zero	-	0 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
4-20 mA	Live-Zero	-	4 ... 20 mA	< -19 mA	> 21.7 mA	undefined	0 mA
0-20 mAL	similar Dead-Zero	below	0 ... 20 mA	-0.2 mA* (-1.8 … -0.01 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	-2 mA	0 mA
4-20 mAL	similar Live-Zero	below	4 ... 20 mA	3.8 mA* (2.2 ...3.9 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	2 mA	0 mA
0-20 mAH	similar Dead-Zero	above	0 ... 20 mA	-0.2 mA* (-1.8 … -0.01 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	> 21.7 mA	0 mA
4-20 mAH	similar Live-Zero	above	4 ... 20 mA	3.8 mA* (2.2 ...3.9 mA)**	20.5 mA* (20.01 ... 21.5 mA)**	> 21.7 mA	0 mA

Tab. 6-1: *Analog output signals - settings and operational modes*

6.2 Menu System - Signal Range

6.2.3.4.1.1 Signal range menu

```
Setup..
In/Outputs..
Analog outputs..
SignalRange:
```

The signal range for the analog outputs is set via the signal "Range" parameter.

When set to **0-20 mA**, a 20 mA signal is generated when the measured concentration is equal to the upper range value. A 0 mA signal is generated when 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 error and simply registers a gas concentration of 0.

The usual method of detecting a severed cable is to use an offset: a concentration corresponding to the lower range value is assigned an analog signal of 4 mA, allowing the detection of a severed or disconnected cable.

This live zero mode is activated by setting the “SignalRange” parameter to **4-20 mA**.

Operation modes conforming to NAMUR 43 (NE 43) recommendations

The operation modes described above do not generate a signal which would allow detection of a failure in the measurement system. In such cases the behaviour 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 am external data acquisition system.

NE 43 contains recommendations for setting analog outputs in order to avoid these situations, and are implemented by X-STREAM analyzers as follows:

Setting range parameters to values other than **0-20 mA** or **4-20 mA** defines specific analog output signals in the case of a failure. Since these values do not occur when there is no error, a data acquisition system is able to distinguish between the following conditions:

- severed cable (no signal (0 mA)),
- failure (signal outside of valid range as in table 6-1, but not 0)
- valid signal (signal within valid range as in table 6-1)
- signal out of range (signal rises or falls slowly to the limit given in table 6-1 and holds this value until the concentration returns to a valid level).

6.2.3.4.1.2 Output1 (2 ... 4) Menu

```
Setup..
In/Outputs..
Analog outputs..
Output1(2...4)..
```

```
Signal:          Comp-1
LowScale:        10 ppm
HighScale:     1000 ppm
▼Zoom..
```

Page 1

Signal: Selects the parameter to be displayed in the corresponding line in the measurement display. Depending on the number of measuring channels and sensors installed in the unit, the following values are available:

Gas components:	**Comp-1 ... Comp-4**
Temperature:	**Temp-1 ... Temp-4,**
Pressure:	**Press-1 ... Press-4,**
Flow:	**Flow-1 ... Flow-4**
Zoom:	**Zoom-C1 ... Zoom-C4**
(nothing):	**None**

A constant signal of either 0/4 mA or 20 mA can be generated to check the output settings. The options are labelled accordingly (**0/4 mA** and **20 mA**).

LowScale: This line determines which concentration value corresponds to the lower signal limit (0 or 4 mA).

HighScale: This line determines which concentration value corresponds to the upper signal limit (20 mA).

Zoom..: This submenu sets the zoom function for the analog output; ☞ 6.2.3.4.1.2.1, page 6-36

***Note*!**
The last line only appears when "signal" is set to a zoom value (e.g. ***Zoom-C1****).*

6.2 Menu System - Analog Outputs Menu

Enter this second menu page to trim the selected analog output signal: Thus, if the signal differs from the selected value (0/4 or 20 mA) it can be adjusted to compensate the offset.

Depending on the selected signal, vary the related parameter to trim the output signal (higher values increase the output signal, and vice versa). Repeat this procedure until the output signal matches.

```
▲     Trim output
Signal:        0/4mA
0/4mA:           100
20mA:            -50
```

Page 2

Select the analog signal to be trimmed. The analog output will supply this signal.

Selectable options: **0/4mA** or **20mA**

Note!

Other options are selectable, to e.g. trim a concentration related output signal!

If "signal" was set to **0/4mA** select this line to trim (finetune) the analog output to exactly provide 0 or 4 mA. (☞ 6.2.3.4.1.1, page 6-33 for information about how to select either life-zero or dead zero).

Accepted values: **-2000 ... +2000**

(corresponding to appr. -2 ... +2 mA)

If "signal" was set to **20mA** select the 4th line to trim (finetune) the analog output to exactly provide 20 mA.

Accepted values: **-1000 ... +1000**

(corresponding to appr. -1 ... +1 mA)

6.2.3.4.1.2.1 Zoom Output Menu

```
Setup..
In/Outputs..
Analog outputs..
Output1(2...4)..
Zoom..
```

```
Switching:    Manual
Zoom:           50 %
Position:   LowScale
Status:          Off
```

Determines how the zoom function is to be activated.
Available options:
Manual, Auto, Inputs

Gives the percentage of the whole measuring range to be zoomed.
Accepted values: **1 ... 99** (%)

Determines which end of the range is to be zoomed.
Available options:
LowScale, HighScale

Current zoom function status.
Available options:
On, Off

Note!
Further details on the function and setting up of the zoom function can be found in ☞ Chapter 5 Startup.

6.2.3.4.2 Digital Outputs Menu

```
Setup..
In/Outputs..
DigitalOutputs..
```

This menu enables the assignment of any digital output available to a function.

Note!

Every unit has, as standard, 4 digital outputs (relays). Depending on the model, 1 or 2 additional cards can be used to increase this number to 9 or 18.

Depending on the number of actually available outputs, this menu consists of 1, 4 or 7 similar pages, of which only the first four are illustrated here.

```
Output1:     Failure
Output2:    MaintReq
Output3:     OffSpec
▼Output4:   FctCheck
```

Page 1

```
▲Output5:     Sample
Output6:          V1
Output7:          V2
▼Output8:         V3
```

Page 2

```
▲Output9:         V4
Output10:         V5
Output11:       Pump
▼Output12:  Lim1Cmp1
```

Page 3

```
▲Output13:  Lim2Cmp1


▼
```

Page 4

Outputs are assigned functions in these lines.
Avalable options: next page.

"Outputs 1-4" are available in every unit. Further pages are indicated by a down arrow (▼) only when at least one extension card (outputs 5 - 13) is installed

"Outputs 5 - 13" are present on the first extension card..

Further pages are indicated by a down arrow (▼) only when a second extension card (outputs 14 - 22) is installed.

6.2 Menu System - Digital Outputs Menu

The following functions can be assigned to each of the digital outputs (max. 22).

Functions can also be assigned to several outputs simultaneously.

Label	Description
Off	Digital output unused
On	Digital output constantly on
Test	Switches the output on and off every second
V1	Switches external valve V1 on autocalibration
V2	Switches external valve V2 on autocalibration
V3	Switches external valve V3 on autocalibration
V4	Switches external valve V4 on autocalibration
V5	Switches external valve V5 on autocalibration
V6	Switches external valve V6 on autocalibration
V7	Switches external valve V7 on autocalibration
V8	Switches external valve V8 on autocalibration
Sample	Switches external sample gas valve on autocalibration
Pump	Switches an external pump
Failure	NAMUR NE 107 “Failure” signal
MaintReq	NAMUR NE 107 “Maintenance request” signal
OffSpec	NAMUR NE 107 “Out of specification” signal
FctCheck	NAMUR NE 107 “Function check” signal
Lim1Cmp1	Concentration alarm 1, component (channel) 1
Lim2Cmp1	Concentration alarm 2, component (channel) 1
Lim1Cmp2	Concentration alarm 1, component (channel) 2
Lim2Cmp2	Concentration alarm 2, component (channel) 2
Lim1Cmp3	Concentration alarm 1, component (channel) 3
Lim2Cmp3	Concentration alarm 2, component (channel) 3
Lim1Cmp4	Concentration alarm 1, component (channel) 4
Lim2Cmp4	Concentration alarm 2, component (channel) 4
Zoom1	Component (channel) 1 analog signal is zoomed
Zoom2	Component (channel) 2 analog signal is zoomed
Zoom3	Component (channel) 3 analog signal is zoomed
Zoom4	Component (channel) 4 analog signal is zoomed
FlowAlm	Alarm by flow sensor
FLimAlm1	Alarm by flow monitor 1
FLimAlm2	Alarm by flow monitor 2

Tab. 6-2: *Options for Digital Outputs*

6.2.3.4.3 Digital Inputs Menu

```
Setup..
In/Outputs..
DigitalInputs..
```

Note!

*This menu line appears only when the parameter "DigitalIO" in the INSTALLED OPTIONS menu is set to **1** or **1+2*** (☞ 6.2.3.5,page 6-43).

This menu enables the assignment of any digital input available to a signal.

Note!

Different models can be installed with 1 or 2 cards with 7 or 14 digital inputs. This menu has 2 or 4 pages depending on the number of available inputs.

```
Input1:              V1
Input2:              V2
Input3:              V3
▼Input4:             V4
```

Page 1

Inputs are assigned to signals in these lines., Available options: ☞ next page.

```
▲Input5:             V5
Input6:              V6
Input7:              V7
▼
```

Page 2

Inputs 1-7 are available on the first extension card. Further menu pages are indicated by the down arrow (▼) only when a second extension card is installed (inputs 8 - 14).

```
▲Input8:             V8
Input9:          Sample
Input10:           Pump
▼Input11:       ZeroAll
```

Page 3

Inputs 8 - 14 are available on the second extension card.

```
▲Input12:       SpanAll
Input13:          Zoom1
Input14:          Zoom2
```

Page 4

6.2 Menu System - Digital Inputs Menu

The following signals can be assigned to any of the 14 available digital inputs.

Functions can also be assigned to several inputs simultaneously.

Label	Description
None	Digital input not used
V1	Activate valve V1
V2	Activate valve V2
V3	Activate valve V3
V4	Activate valve V4
V5	Activate valve V5
V6	Activate valve V6
V7	Activate valve V7
V8	Activate valve V8
Sample	Activate sample gas valve
Pump	Activate pump
ZeroAll	Initiate zero calibration of all channels
SpanAll	Initiate span calibration of all channels
ZSCalAll	Initiate zero and span calibration of all channels
CalCancl	Abort all currently running calibrations
Zoom1	Activate zoom for component (channel) 1 analog signal
Zoom2	Activate zoom for component (channel) 2 analog signal
Zoom3	Activate zoom for component (channel) 3 analog signal
Zoom4	Activate zoom for component (channel) 4 analog signal
FlowAlm	Enables connection and use of an external digital gas flow alarm

Tab. 6-3: *Options for Digital Inputs*

☞ Chapter 7 includes detailed descriptions of the configuration and execution of calibrations with valves.

6.2.3.4.4 IntSHS Menu

```
Setup..
In/Outputs..
IntSHS..
```

Note!
This menu appears only when the parameter in the “Installed Options - Valves” is set to ***Internal*** *or* ***IntExt*** *(*☞ 6.2.3.5, page 6-43)

This menu configures the optional internal components for routing gas (valves and pumps) to be used in autocalibration procedures.

```
Gas1:              V1
Gas2:              V2
Gas3:              V3
▼Gas4:             V4
```

Page 1

Each available gas inlet (*"Gas 1 ... Gas 8"*) with a valve connected is assigned a virtual valve label (**V1...V8, Sample**). (If the components were installed in the factory, the basic settings will already have been set).

These valves are then assigned a channel and function (zero or span gas) in the VALVE ASSIGNMENT MENU (☞ 6.2.3.2.2, page 6-26).

Note!
Depending on the model, 1 or 2 valve blocks with up to 4 or 8 valves can be installed.

```
▲Gas5:         Sample
Gas6:              V5
Gas7:              V6
▼Gas8:             V7
```

Page 2

```
▲Pump1:          Pump
Pump2:            Off
```

Page 3

Additionally, the method used to control any installed pumps can be set.

Note
Depending on the model, up to 2 pumps may be installed.

For an overview of all available options:
☞ next page.

6.2 Menu System - IntSHS Menu

Label	Description
Off	Switches the assigned component (valve or pump) off.
On	Switches the assigned component (valve or pump) on.
Test	Switches the assigned component (valve or pump) on and off every second.
V1	Valve at selected gas inlet is assigned the value “V1”
V2	Valve at selected gas inlet is assigned the value “V2”
V3	Valve at selected gas inlet is assigned the value “V3”
V4	Valve at selected gas inlet is assigned the value “V4”
V5	Valve at selected gas inlet is assigned the value “V5”
V6	Valve at selected gas inlet is assigned the value “V6”
V7	Valve at selected gas inlet is assigned the value “V7”
V8	Valve at selected gas inlet is assigned the value “V8”
Sample	The gas inlet is a sample gas inlet. The valve assigned to it is controlled via the **Sample** software option. ***Note!*** *There is only one option* ***Sample*** *. This means that in order to control two sample gas valves during autocalibration, the value* ***Sample*** *must be assigned to two inlets. During calibration, both valves are then controlled synchronously.*
Pump	The pump is controlled by the **Pump** software option. ***Note!*** *There is only one option* ***Pump****. This means that in order to control two pumps during autocalibration, the lines “Pump1”* ***and*** *“Pump2” must be assigned the value* ***Pump****. During calibration, both pumps are then controlled synchronously.*

Tab. 6-4: *Parameter IntSHS options*

Note!
Each virtual valve ***V1*** *to* ***V8*** *is normally only assigned to one gas inlet, “Gas1” to “Gas8”. Double assignments are possible, but only meaningful if the unit is configured accordingly.*

☞ Chapter 7 includes detailed descriptions of the configuration and execution of calibrations with valves.

6.2.3.5 Installed Options Menu

```
Setup..
Installed Options..
```

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

```
Valves:        Internal
COM-Interf:         Yes
Pump:               Yes
▼FlowAlm:           Yes
```

Page 1

Indicates whether valves are installed.

Available options:

Internal, **External**, **Int**(ernal)**+Ext**(ernal), **None.**

Indicates whether a serial interface is installed (**Yes**) or not (**No**)

Indicates whether an internal pump is installed (**Yes**) or not (**No**).

Indicates whether flow switches are installed (**Yes**) or not (**No**).

```
▲DigitalIO:           1
Pressure:      Internal
Analog outputs        4
More..
```

Page 2

Indicates whether digital I/O cards are installed (**1, 1+2**) or not (**None**)

Determines whether a barometric pressure sensor is installed.

Available options:

Manual: No sensor available. Ambient atmospheric pressure must be entered manually (☞ 6.2.3.3 page 6-28)

Internal: Internal pressure sensor installed.

External: Pressure sent via network (e.g. DeltaV)

Indicates how many analog outputs are installed. Accepted values: **1 ... 4**

More sensors
(☞ 6.2.3.5.1 page 6-44).

6.2.3.5.1 Installed options, More menu

```
Setup..
Installed Options..
More..
```

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
TempSensor:   Temp-1
FlowSensor:   Flow-1
```

Indicates whether and if so, which possibly installed temperature sensor is to be assigned to the selected channel.

Available options:

None, Temp-1, Temp-2, Temp-3, Temp-4

Indicates whether and if so, which possibly installed flow sensor is to be assigned to the selected channel.

Available options:

None, Flow-1, Flow-2

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to select a different channel.

6.2.3.6 Communications settings

```
Setup..
Communication..
```

3

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

```
Protocol:    MODB RTU
MODB-Mode:      32Bit
ID-Number:          2
▼Interface:     RS485
```

Page 1

Selects Modbus protocol for the serial interface.

Available options:

MODB RTU, Sensor

Note!

*The **Sensor** option is for maintenance purposes only.*

Sets Modbus mode of operation.

Available options:

32Bit (=Daniel mode),

16BitLow (=Modicon mode, LOW word first)

16BitHi(g)**h** (=Modicon mode, HIGH word first)

Enter instrument ID for network.

Possible values: 1 .. 254

Selects installed RS interface.

Available options:

RS232, **RS485, Ether**(net)

Note 1

☞ *Chapter 9 includes a detailed description of the Modbus parameters.*

A general description of Modbus is also to be found in the appendix.

Note 2

*To be able to use the optional Ethernet interface, enable **MODB RTU** and **Ether**.*

```
▲Baud rate:     19200
Parity:          None
MAC:      AB234CDE56
```

Page 2

Select baud rate of the serial interface.

Available options:

2400, **4800**, **9600**, **19200**

Sets whether a parity bit is used.

Available options:

None, **Even**, **Odd**

Note!

*To view first 2 lines, set "Interface" to other than **Ether***

MAC ID of the Ethernet port (visible only if "Interface" is set to **Ether**)

6.2.3.7 Alarm Setup Menu

```
Setup..
Alarms..
```

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

Component ?

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
Level1:        100 ppm
 Function:         Low
Level2:        500 ppm
▼Function:        High
```

Page 1

Sets first concentration alarm level.

Selects alarm output mode for level 1.
Available options:
Off, **Low**, **High**, **Off FS**, **Low FS**, **High FS**
(☞ Chapter 5 includes more details about these options are alarm settings)

Sets second concentration alarm level.

Selects alarm output mode for level 2.
Available options:
Off, **Low**, **High**, **Off FS**, **Low FS**, **High FS**
(☞ Chapter 5 includes more details about these options and alarm settings)

Note!
The unit for concentration values (here: ppm) is taken from the corresponding line in the DISPLAY SETUP menu (☞ 6.2.3.1.3, page 6-19).

```
▲Hysteresis:  5.00 %

FlowLimit:   1 l/min
FlowLimAlm:   Low FS
```

Page 2

A hysteresis level for the switchpoints can be entered here (as % of upper range value). Permissible values: **0 ... 50 %**.

If a flow sensor is assigned to the selected channel (☞ 6.2.3.5.1, page 6-44) enter this line to specify a flow limit, to activate an alarm as a function of flow dropping below this limit (see next menu line).

Permissible values:
equivalent to **0 ... 2000** ml/min

Note!

The unit for flow measurement is taken from the corresponding line in the DISPLAY SETUP menu (☞ 6.2.3.1.6, page 6-21).

Enter this line to specify whether an installed flow sensor is used to only measure the flow (**Off FS**) or to measure the flow **and** activate alarms (**Low FS**).

Available options: **Off FS, Low FS**

Off FS*: Alarm functionality is switched off, an assigned output is set to FailSafe mode (relay is activated).*

Low FS*: Alarm functionality is switched on, output is set to FailSafe mode (alarm deactivates relay). Relay is de-energized if flow is below given limit.*

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

6.2.3.8 Save-Load Menu

```
Setup..
Save-Load..
```

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

Note 1

Some of the following procedures require the installation of terminal software on external hardware (e.g. a PC connected to the service interface) to store the data.

Note 2

During these procedures a message is displayed indicating how to abort the procedure.

```
     Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

Page 1

This line initiates the procedure for saving configuration data to an external device: the data are sent to the service interface (service port X2).

This line initiates the procedure for restoring configuration data: the data are loaded from the service port.

CAUTION!

This overwrites all configuration data. Any changes made since the last backup will be undone.

Note!

This procedure requires a further confirmation to start.

This line initiates the procedure for an online comparison of the current configuration data with the data stored via the service port.

The current configuration is not overwritten. Downloaded data are deleted on completion of this procedure.

6.2 Menu System - Save-Load Menu

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

Page 2

This function replaces the current configuration with factory settings.

This function stores the current configuration as a user dataset in the FRAM memory.

This function replaces the current configuration with the user dataset.

CAUTION!

All 3 functions overwrite internal data. Any changes made since the last backup will be undone.

Note!

These procedures require a further confirmation to start.

Comments:

FactData This represents the factory settings. The data are stored in FRAM memory. The user can copy and change these data in RAM, but these changes cannot be saved as FactData.

UserData A user's own configuration can be saved to FRAM memory and loaded from FRAM.

CfgData The configuration used at runtime and stored in RAM.

At startup, the checksum of the configuration is calculated. If an error occurs, the user data are loaded into RAM, overwriting the CfgData configuration.

This ensures that the instrument is always ready for use.

☞ Chapter 7 includes further details of the Save-Load functions.

6.2.4 Status Menu

```
Status..
```

Note!
All entries in this menu and its submenus are not editable and provide information only.

```
1 Failures..
0 Check requests..
1 Function checks..
▼0 Off-specs..
```

Page 1

Failure messages
☛ 6.2.4.1, page 6-51

Maintenance requests
☛ 6.2.4.2, page 6-52

Function checks
☛ 6.2.4.3, page 6-53

Off-specs
☛ 6.2.4.4, page 6-54

Note!
The numbers at the start of each line on page 1 indicate how many messages of the corresponding type are currently active.

```
▲Pump           Off
Calibration..
Measurement..
▼Alarms..
```

Page 2

Status of optional internal pump: **On** or **Off**

Calibration status
☛ 6.2.4.5, page 6-55

Measurement status
☛ 6.2.4.6, page 6-58

Alarm status
☛ 6.2.4.7, page 6-60

```
▲Zoom1          Off
Zoom2           Off
Zoom3           Off
Zoom4           Off
```

Page 3

Indicates whether zoom is active for the analog outputs. (☛ 6.2.3.4.1.2.1, page 6-36)

6.2.4.1 Failures

```
Status..
1 Failures..
```

The number in the *“Failures”* line in the previous menu indicates how many errors are currently active (here: 1). In the following menus, **Yes** is displayed in the correspondung number of lines.

For more details on troubleshooting, ☞ Chapter 8 Troubleshooting.

Note!

If one or more failures are active, the left-hand LED on the front panel flashes red. The corresponding relay is also activated, if configured for NAMUR error messages.

```
ROMmemory        Yes
SensTimeout       No
SensCmdFail       No
▼
```

Page 1

(e.g.: a ROM memory error is indicated)

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
▲ADC-Error        No
Chopper           No
Detector          No
Source            No
```

Page 2

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to select a different channel.

6.2.4.2 Maintenance requests

```
Status..
0 Check requests..
```

The number in the *“Check requests”* line in the previous menu indicates how many errors are currently active (here: 0). In the following menus, **Yes** is displayed in the corresponding number of lines.

For more details on checking maintenance requests, ☞ Chapter 8 Troubleshooting.

Note!

If maintenance is requested, the middle LED on the front panel flashes red. The correspon-ding relay is also activated, if configured for NAMUR error messages.

```
FlowAlm              No
NVRAM fail           No

▼
```

Page 1

Component ?

Multi-channel unit:

Select the component in the SELECT COM-PONENT menu.

```
▲ZCalTolChk          No
SCalTolCh            No
ZCalRefused          No
▼SCalRefused         No
```

Page 2

```
▲FlowMonAlm          No
```

Page 3

Multi-channel unit:

Press the ← key to enter the SELECT COM-PONENT menu to select a different channel.

6.2.4.3 Function checks

```
Status..
1 Function checks..
```

The number in the *"Function checks"* line in the previous menu indicates how many errors are currently active (here: 1). In the following menus, **Yes** is displayed in the correspondung number of lines.

For more details on function checks, ☞ Chapter 8 Troubleshooting.

Note!

If one or more function check messages are active, the middle LED on the front panel flashes red. The corresponding relay is also activated, if configured for NAMUR error messages.

```
Calibration       Yes
SvcPort > Cf       No
NotSampleGas       No
▼Warm-up           No
```

Page 1

(e.g.: a calibration is currently in progress)

```
▲LocalAccess       No
Simulation         No
```

Page 2

6.2 Menu System - Status Menu

6.2.4.4 Off-specs

```
Status..
0 Off-specs..
```

The number in the *“Off-specs”* line in the previous menu indicates how many errors are currently active (here: 1). In the following menus, **Yes** is displayed in the correspondung number of lines.

For more details on troubleshooting, ☞ Chapter 8 Troubleshooting.

Note!
If one or more off-spec messages are active, the middle LED on the front panel flashes red. The corresponding relay is also activated, if configured for NAMUR error messages.

```
Pressure         No
Unlinear         No

▼
```

Page 1

Note!
*The “Pressure” line is only displayed when the parameter in the INSTALLED OPTIONS menu is set to a value other than **Manual**.*

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
▲TempRange       No
RangeOverflo     No
TempSensor       No
```

Page 2

Multi-channel unit:

Press the 🡐 key to enter the SELECT COMPONENT menu to select a different channel.

6.2.4.5 Calibration status

```
Status..
Calibration..
```

If the unit is currently being calibrated, this menu provides information on the current status. Unlike the CONTROL - ZERO/SPAN CALIBRATION menus, for which a channel must be selected for multi-channel units, the data displayed here are not channel dependent; i.e., the general status is displayed here.

```
Gasflow               V2
Procedure        Purging
Time                10 s
▼AutoCal in..
```

Page 1

Gasflow:

Possible values: **Sample**, **V1...V8, None**

These values represent the internal and/or external valves used for autocalibration. All valves except the sample valve are user configurable: As each can be assigned either zero or span gas, not the type of gas is listed here but only the valve designator.

Shows the current calibration status

Possible values:

None: no calibration in progress

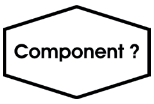
Zeroing: zeroing a channel

Spanning: spanning a channel

Purging: purging gas lines

The third line indicates the time remaining for the currently active procedure.

This submenu displays information about the next autocalibration (☞ 6.2.4.5.1, page 6-57)



Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
▲     Calibration
Offset      0.000000
  Factory settings
Offset      0.000000
```

Page 2

These two lines show a comparison of the offsets calculated during the latest calibration and during factory startup. The values may be used for diagnostics if e.g. measurement results are not as expected.

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to select a different channel.

Note!

For more detailed information about calibration status, *☞ Chapter 7 Maintenance.*

6.2.4.5.1 Auto calibration

```
Status..
Calibration..
AutoCal in..
```

Note!
This menu is available only if autocalibration intervals have been specified (☞ 6.2.3.2.3, page 6-26).

```
ZeroAll           1 h
ZeroAll          15 min
ZSCalAll          1 h
ZSCalAll         15 min
```

The first two lines show the remaining time until the next zero calibration for all channels is started,

Lines 3 & 4 give the similar information for a combined zero & span calibration.

Note!
In case there is an interval specified for one procedure only (ZeroAll or ZSCalAll; ☞ 6.2.3.2.3, page 6-26), the related lines for the other procedure will be hidden!.

6.2.4.6 Measurement status

```
Status..
Measurement..
```

```
Temp-1          54 °C
Temp-2          44 °C
Temp-3          44 °C
▼Temp-4         44 °C
```

Page 1

The first menu page shows the temperatures measured by the installed sensors.

Note!

The number of displayed lines varies depending on the number of installed sensors in your specific instrument.

In any case this menu page shows the measuring values of ALL installed sensors, including such assigned to channels (☞ 6.2.3.5.1, page 6-44). If there are channel assigned sensors, they are once more listed on the related channel specific menu page (☞ next page).

```
▲Pressure   1014 hPa



▼
```

Page 2

Displays the current pressure, either from an internal or external sensor or manually entered.

☞ 6.2.3.5, page 6-43 for more information on how pressure is measured.

6.2 Menu System - Status Menu

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
▲RawRef      2.000000
RawMeas      1.000000
Ref/Meas     2.000000
CO2.1       134.1 ppm
```

Page 3

Displays the raw reference value of the detector (for selected measurement principles only).

Displays the raw measuring value of the detector. This is the signal without linearisation, compensation or conversion.

Ratio of RawRef to RawMeas. This value can be used for diagnostic purposes.

Current measurement value in the user-defined measurement unit.

```
▲TempSensor     50 °C
FlowSensor   1 l/min
SrcCurrent   1000 mA
```

Page 4

If a temperature sensor is assigned to the selected channel, this line shows the current temperature.

If a flow sensor is assigned to the selected channel, this line shows the current gas flow.

If the selected channel is an IR channel, this line shows the IR source current.

Note!

A value of 0 in one or both of the first two lines of page 4 is not necessarily an error. Depending on the measuring procedure used, a value of 0 may be valid.

At maximum 8 secondary values (pressure, temperature, flow, source current) can be shown. Source current values are shown only if this limit is not yet reached.

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to select a different channel.

6.2.4.7 Alarm status

```
Status..
Alarms..
```

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

```
       Alarms

Level1            Off
Level2            Off
```

Displays the current status of the concentration alarms for the selected channel. If an alarm is active, the corresponding line displays the value **On**, otherwise **Off**.

An active concentration alarm also generates a corresponding message in the status line of the measurement display (e.g.. CO.1 Alarm Level1).

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to open the same menu for a different channel.

6.2.5 Info menu

```
Info..
```

```
X-STREAM-2M
Revision          1.0
Sensor           1077
▼XCA05812345678
```

Page 1

- Analyzer model
- Installed software version
- Software version of DSP processor (“0” indicates no DSP installed)
- Analyzer serial number

```
▲MAC       AB234CDE56


▼
```

Page 1b (optional)

Note!
*This page is shown only, if "Interface" is set to **Ether**, otherwise it is skipped while scrolling.*

```
▲Range..
Installed Options..
Pumpcontrol      Menu
▼Factory settings..
```

Page 2

Information on measurement range
☞ 6.2.5.1, page 6-62

Installed options
☞ 6.2.5.2, page 6-63

Indicates how the pump (either internal or connected to an digital output) is controlled.
Note!
This line only appears if a pump is available!

Factory settings
☞ 6.2.5.3, page 6-64

4

```
▲Europe..
North America..
Latin America..
Asia-Pacific..
```

Page 3

Addresses for customer services: select a line to obtain contact information for the region.

6.2.5.1 Information on measurement range

```
Info..
Range..
```

Component ?

Multi-channel unit:

Select the component in the SELECT COMPONENT menu.

This menu displays information on the range for the selected channel.

```
MinRange      400 ppm
MaxRange     1000 ppm
SpanRange      110 %
```

These two lines display the measuring ranges to be used for output zooming without operating the unit outside its specifications (☞ 6.2.3.4.1.2, page 6-34).

Displays the maximum permitted span gas factor for the upper range value (☞ chapter 7, Calibration procedures).

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to select a different channel.

6.2.5.2 Installed options

```
Info..
Installed Options..
```

```
 Installed Options
Valves        Int+Ext
COM-Interf        Yes
▼Pump             Yes
```

Page 1

These pages display information about the options installed in the unit.

To edit the parameters, the entries in the SETUP menus must be used (☞ 6.2.3.5, page 6-43).

```
▲DigitalIO         No
Pressure     Internal
More..
```

Page 2

More information
☞ 6.2.5.2.1 below

6.2.5.2.1 Installed options, more information

```
Info..
Installed Options..
More..
```

Component ?

Multi-channel unit:

Select another component in the SELECT COMPONENT menu to see the options for this channel.

```
FlowSensor        1+2
TempSensor     Temp-1
```

6.2.5.3 Factory settings

```
Info..
Factory settings..
```

This menu is not for users' information, but enables basic settings to be edited.

Changing any of the parameters in this menu can result in incorrect results being displayed; in the worst case, the unit may cease to function.

For this reason, access to this level is protected with a level 4 code and granted only to specially trained personnel.

The code for access level 4 must be entered to gain access to this menu.

Chapter 7
Maintenance and other Procedures

7.1 Introduction

Maintenance carried out on a regular basis ensures long-term efficiency of your EMERSON Process Management gas analyzer!

This chapter gives instructions not only for maintenance procedures, but also covers several procedures useful for proper operating the instruments.

For more detailled information about how to:

General maintenance information ☞ 7.2, page 7-2
Perform a leak test ☞ 7.3, page 7-4
Perform a calibration ☞ 7.4, page 7-5
Replacing Worn Out sensors ☞ 7.5, page 7-43
Clean the instrument´s outside ☞ 7.6, page 7-54
Backup / restore configuration data sets ☞ 7.7, page 7-55

7.2 General Maintenance Information

Intervals given in the following tables are based on standard operating conditions (ambient temperatures +10 ... +40 °C / +50 ... +104 °F; temperature changes < 10 K /hr).

Try cleaning contaminated components.

Replace components showing corrosion, or not passing inspections or tests!

Maintenance intervals must be shortened for differing operating conditions, and if aggressive gases are supplied.

Take care of special maintenance instructions in separate manuals for accessories or safety equipment, e.g. flame arrestors, infallible containments, etc.

If applicable, consider the manual addendums for instruments for hazardous areas!

Visual Inspections		
Component		**Interval**
Tubing, flexible	Leakage, embrittlement, contamination	Once a year
Tubing, stainless steel (SS)	Corrosion, contamination	
Pressure sensor, pressure switch, Flowmeter	Corrosion, leakage	
Pump	Fixed screws, swing free to move	
Valve block	Corrosion, leakage	
Flame arrestors	Corrosion, damages, firmly seated	
Field housings (IP 66 / NEMA 4X)	Corrosion, damages on enclosure and gaskets	
Field housings stopping plugs	Firmly seated	
Field housings cable glands	Firmly seated	

7.2 General Maintenance Information

Tests		
Component		**Interval**
Tubing, flexible	Leak Test	Once a year
Pressure sensor, pressure switch		
Valve block		
Pump diaphragm	Leak Test	After 5,000 hrs of operation (=208 days, if continuously operating)
Capillars	Pressure drop	Once a year
Flame arrestors	Pressure drop	See instructions in separate manual
Infallible containments	Several	See instructions in separate manual
RAW measuring values	Verify counts for zero gases *(decreasing counts may indicate contamination of optical components)*	Monthly, then quarterly *Acceptable values:* *photometer quotient: 1.0 ± 0.1* *NO, N_2O quotient: 1.0 ± 0.2* *pO_2, eO_2, TC: 0 ± 100,000 counts (for zero gas N_2)*

Replace Components Regularly	
Component	**Interval**
Electrochemical oxygen cell	Depending on output signal (see details later in this section)
Filter, internal	Once a year, at least when contaminated
Filter, external	Several times a year, depending on process conditions

7.3 Performing a Leak Test

To achieve best and proper measuring results you must ensure the gas path system does not have leaks.

The following procedure describes how to perform a leak test with focus on the instrument.

The gas path system should be leak tested at least on a bimonthly basis and after maintenance, replacement or repair of gas path parts.

Note!

It is recommended to include external equipment (e.g. cooler, dust filters, etc.) into a leak test!

WARNING

HAZARD FROM GASES

Before opening gas paths they must be purged with ambient air or neutral gas (N_2) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

Required tools

- U-turn manometer for max. 1.45 psi (100 mbar)
- Stop valve

Procedure

- Connect the water filled u-turn manometer to the analyzer's sample gas output (disconnect external gas lines).
- Install the stop valve between gas input fitting and a Nitrogen (N_2) supply.
- Open the stop valve until the internal gas path is under pressure of approx. 0.725 psi/50 mbar (corresponding to 19.7 inch/500 mm water column)
- Close the stop valve. After a short time for the water to balance, the water level must not change over a time period of approx. 5 minutes!

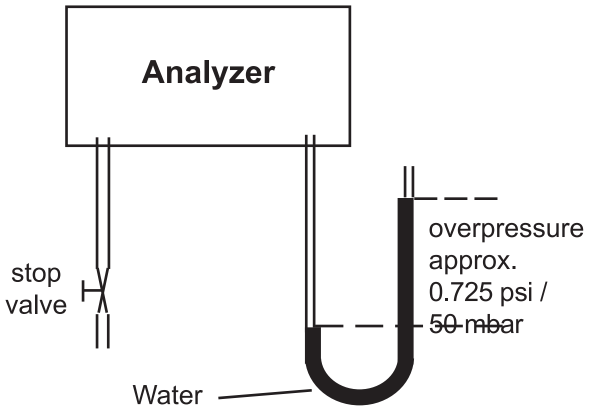


Fig. 7-1: Leak Testing With U-Turn Manometer

Max. pressure 7.25 psig (500 mbar)!

Multi channel instruments: Analyzers with parallel tubing require separate leak tests for each gas path !

7.4 Calibration Procedures

Note!

To achieve best and proper measuring results it is recommended to perform zero and span calibrations on a regular weekly basis.

Also a zero calibration must always precede a span calibration!

Zero calibration

To perform a zero calibration supply either Nitrogen (N_2) or another suitable zero gas [conditioned ambient air or industrial air (NOT for Oxygen measurement!)] to the gas path.

Span calibration

Supply span gases with concentrations 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!

If the Oxygen concentration is known, ambient air may be used for an Oxygen channel span calibration.

X-STREAM gas analyzers support several calibration procedures:

Manual calibration

Typically a calibration procedure is carried out manually by supplying the gases sequentially by hand and activating the procedures via front panel keys.The operator has to take care to consider purge times and supply the proper gases in correct order.

It is the operators responsibility to not perform a span calibration without a preceding zero calibration!

Advanced calibration

Advanced calibration is a more comfortable variation of manual calibration, providing ONE KEY calibrations supported by internal and/or external valves. The analyzer automatically supplies the right gas and considers purge times.

Remote calibration

Remote calibrations may be activated by means of digital inputs or Modbus commands. Calibrations activated via digital inputs require either internal or external valves to be installed. Modbus supports both calibrations with or without valves as well as calibration sequences.

Unattended automatic calibration

Unattended automatic calibrations 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.

The main advantage is that no user interaction is required to start a calibration or during calibrations: The analyzer automatically supplies the right gas, considers purge times and, that a span calibration has to be preceded by a zero calibration.

7.4.1 Preparing Calibrations

CAUTION

OPERATION AT LOW TEMPERATURES

When operating an instrument at temperatures below 0 °C (32 °F), do NOT apply gas nor operate the internal pump before the warmup time has elapsed!

Violation may result in condensation inside the gas paths or damaged pump diaphragm!

Do NOT calibrate the TRACE OXYGEN sensor (tO_2) without prior reading the instructions!

Together with each sensor an installation manual is shipped, also giving comprehensive calibration information.

Read these information prior intending to activate calibration procedures!

Do NOT calibrate the TRACE MOISTURE sensor!

The sensor is completely calibrated with all calibration data stored in its flash memory and does not require recalibration:

If the sensor is included into a calibration procedure, it might end up with a wrong calibration and unusable sensor. Therefore the analyzer's trace moisture measurement channel has to be excluded from any autocalibration procedures! **You have to care for not calibrating the trace moisture sensor each time a calibration is performed!**

For proper measurement results we recommend to exchange the sensor regularly after 12 months of operation. For instructions on how to exchange, ☞ X-STREAM X2 instruction manual

Before performing any actions, make sure the required calibration gas is applied and flowing!

Supply all calibration gases with the same flow and pressure as the sample gas (recommended: approx. 1 l/min), and utilizing the correct gas fitting.

Ensure the warm-up time after switching on has elapsed! Warm-up time depends on installed measuring system and configuration, ☞ measurement specifications in chapter 3!

7.4.1 Preparing Calibrations

Before starting calibrations it is required to tell the instrument the calibration gas concentrations.

```
Setup..
Calibration..
Calibration gases..
```

Starting from the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP-CALIBRATION.. menu and directly enter the CALIBRATION GASES.. menu.

Component ?

Multi-channel unit:
Select the channel to be calibrated in the SELECT COMPONENT menu.

```
Calibration gases

ZeroGas:      0.0 ppm
SpanGas:    500.0 ppm
```

Enter the concentration value for the zero gas to be used during zero calibration.

Enter the concentration value for the span gas to be used during span calibration.

Note!
The units for the calibration gases are taken from the related entry in the display setup menu.

Multi-channel unit:
Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

When done, press the ← key to return to the CALIBRATION menu.

7.4.1 Preparing Calibrations

```
Calibration gases...
Tol.Check:         Off
Hold on cal:        On
▼Purge time:      15 s
```

Example:

Measuring range: 0 ... 50 %
Zero gas: 0 %
Span gas: 50 %

Situation:

Due to a fault zero gas is supplied to carry out a span calibration, instead of span gas.

Tolerance check disabled (Off):

The analyzer calibrates the span with the wrong gas resulting in an analyzer out of tune.

Tolerance check enabled (10%; AutoOff):

Starting a span calibration with zero gas connected instead of span gas, the analyzer gives an error message and stops calibrating because the measured (expected span gas) value differs more than 10 % from the upper measuring range limit.

By default the option "Tol.Check" (tolerance check) is disabled (**Off**).

So tolerance check helps avoiding calibrating with a wrong gas applied (e.g. starting a span calibration while zero gas is flowing) resulting in an instrument out of tune (see example to the left side).

With tolerance check enabled (**10%**) during calibration the analyzer checks that the entered (setpoint) values for zero gas and span gas are reasonable compared to the currently flowing calibration gas. If this gas concentration differs more than 10 % of measuring range from zero gas (during zero calibration) or span gas setup (during span calibration), calibration is aborted and a maintenance request alarm is set (LED and optional relay output). Resetting the alarm requires to perform a valid calibration or to confirm it within the CONTROL - ACKNOWLEDGEMENTS.. screen.

The 3rd option (**AutoOff**) has the same functionality as **10%** except that the maintenance request is reset after 2-3 minutes.

There are still situations when tolerance check must be disabled, e.g. when calibrating after changing the span gas concentration. In this cases select **Off**.

Note!

Unacknowledged maintenance requests are stored even if the instrument is switched off and on again!

In addition: If, for example, a calibration was aborted because of a tolerance check, the maintenance request is 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!

7.4.1 Preparing Calibrations

```
Calibration gases...
Tol.Check:          Off
Hold on cal:         On
▼Purge time:       15 s
```

Note!
The last line ("purge time") shows up only if the valve option is other than ***none*** *(see INSTALLED OPTIONS menu) and is used for advanced, remote and unattended calibrations only (☞ 7.3.1.1.4, page 7-14).*

If you do not intend to carry out valve supported calibrations, continue with ☞ 7.3.2, page 7-15.

7.4.1 Preparing Calibrations

7.4.1.1 Valve Assignment for Valve Supported Calibrations

As described earlier, several calibration procedures require installed internal and/or external valves.

In addition this requires all requested calibration gases to be connected to the valves and the valves to be software assigned to the gases.

Why is assigning valves required?

For such calibrations 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.

Example:

- *Dual channel analyzer for measuring CO and CO_2.*
- *Spangases are CO and CO_2, zero gas for both channels is N_2.*

***Without** variable assignment one would need to zero span channel 1 separately from channel 2. Taking into account the purge times before a calibration calculation starts, to ensure the measuring cells are filled with calibration gas, the whole procedure would take a quite long time.*

***With** variable valve assignment the operator can specify e.g. the valve V1 to be the zero gas valve for channel 1 AND channel 2. Now, when starting a zero calibration, the analyzer calculates the zero values for both channels at a time!*

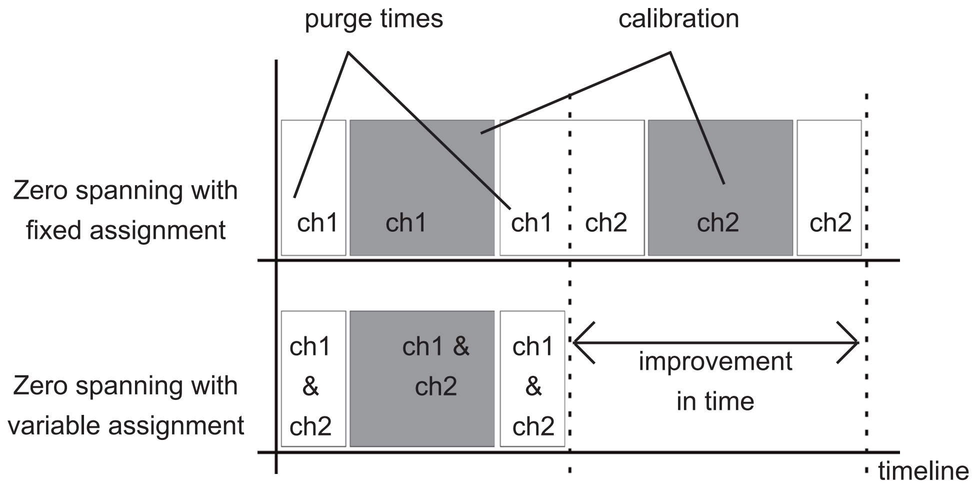


Fig. 7-2: Calibration Improvement by Variable Valve Assignments

7.4.1 Preparing Calibrations

Before starting to assign valves to gases and channels, you need to check what type of valves is used (external or internal):

```
Setup..
Installed Options..
```

Open the SETUP - INSTALLED OPTIONS.. menu and check the first line ("*Valves:*")

```
Valves:       Internal
COM-Interf:        Yes
Pump:              Yes
▼Flow monitor:     Yes
```

If this menu (as the example to the left) shows there are **internal** valves installed, open the INTSHS menu (☞ 7.3.1.1.1, page 7-10) to assign valves.

```
Valves:       External
COM-Interf:        Yes
Pump:              Yes
▼Flow monitor:     Yes
```

If the menu (as the example to the left) shows there are **external** valves installed, open the DIGITAL OUTPUTS menu (☞ 7.3.1.1.2 page 7-12) to assign valves.

```
Valves:        Int+Ext
COM-Interf:        Yes
Pump:              Yes
▼Flow monitor:     Yes
```

If the menu (as the example to the left) shows there are **internal and external** valves installed, valve assignment has to be done utilizing both, the INTSHS (☞ 7.3.1.1.1 page 7-10) and the DIGITAL OUTPUTS menu (☞ 7.3.1.1.2 page 7-12).

7.4.1.1.1 Internal Valve Assignment

If your analyzer provides internal valves, at first open the SETUP - IN/OUTPUTS - INTSHS menu to assign the valves to the gas inlets:

```
Setup..
In/Outputs..
IntSHS..
```

The IntSHS menu allows to configure the optional internal valves for routing gas.

Each available analyzer gas inlet (*"Gas 1 ... Gas 8"*) with a valve connected is assigned a virtual valve label (**V1...V8, Sample**). (If the components have been installed in the factory, the configuration is already setup).

```
Gas1:          Sample
Gas2:              V1
Gas3:              V3
▼Gas4:            Off
```

Page 1

```
▲Gas5:            Off
Gas6:              V2
Gas7:             Off
▼Gas8:            Off
```

Page 2

Notes!

Depending on the analyzer model, 1 or 2 valve blocks with up to 4 or 8 valves can be installed.

The number of available gas connections depends on the analyzer model and varies from 4 to 8.

If already factory setup, changing the configuration could result in inproper operation!

7.4.1 Preparing Calibrations

The exemplary settings on the previous page could relate to the following analyzer configuration:

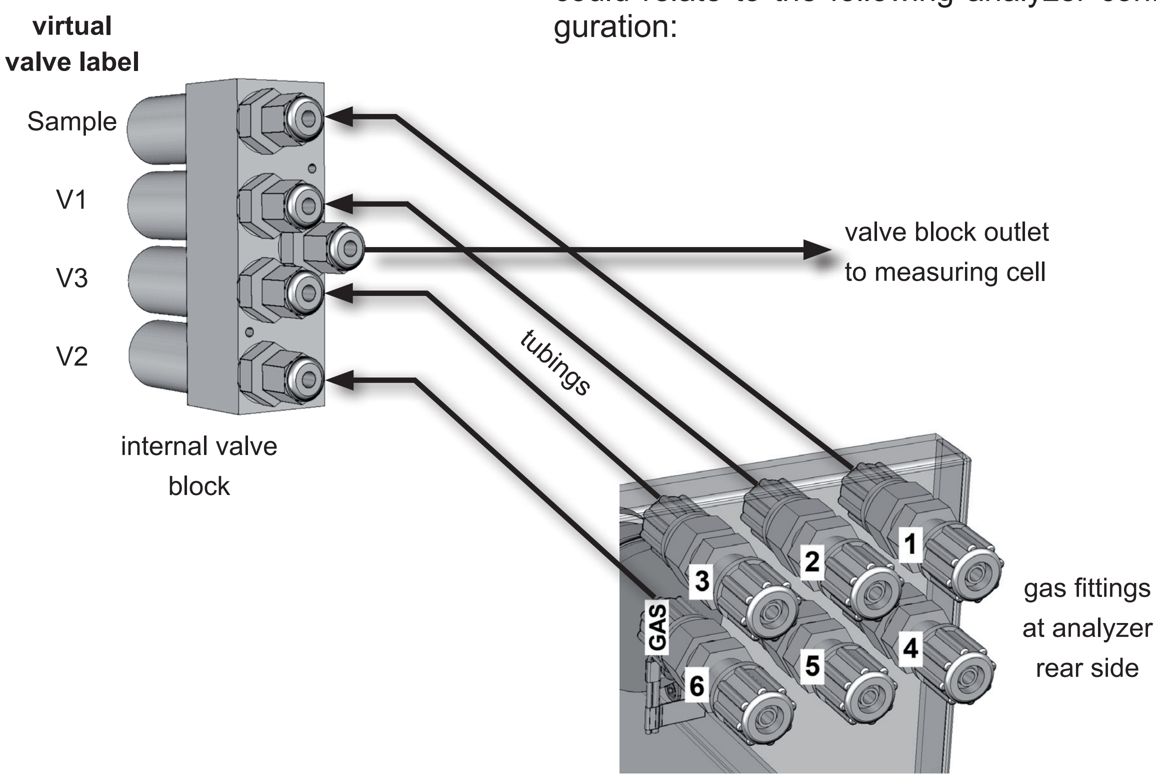


Fig. 7-3: Internal Valves Assignments

The next step is to assign the internal valves to the channels. If there are no external valves to be controlled by your analyzer, continue with ☞ 7.3.1.1.3 page 7-13.

7.4.1.1.2 External Valve to Digital Output Assignment

```
Setup..
In/Outputs..
DigitalOutputs..
```

If your analyzer has to control external valves, at first check if all valves required for calibration are connected to digital outputs.

Then open the SETUP - IN/OUTPUTS - DIGITALOUTPUTS menu to software assign the valves to the outputs:

```
Output1:      Failure
Output2:    MaintRequ
Output3:      OffSpec
▼Output4:    FctCheck
```

Page 1

```
▲Output5:      Sample
Output6:           V1
Output7:           V2
▼Output8:          V3
```

Page 2

This menu configures the digital outputs: All outputs (default and optional) support the same range of signals/functions. "Outputs 1-4" are available in every unit and by default setup to provide NAMUR signals (see figures to the left).

Further pages are indicated by a down arrow (▼) only when at least one extension card (outputs 5 - 13) is installed

"Outputs 5 - 13" are present on the first extension card (outputs 9 to 13 on menu pages 3 & 4 not shown in this example).

Note!

Depending on the analyzer model, 1 or 2 Digital I/O extension cards can be installed.

The next step is to assign the valves to the channels: Continue with ☞ 7.3.1.1.3 page 7-13.

7.4.1.1.3 Calibration Valve Assignment

For each channel a valve has to be assigned zero gas valve or span gas valve, whereat the valves can be freely assigned to any channel. This includes:

- selecting the same combination for all channels
- selecting combinations where one valve has the same function for several channels
- selecting combinations where one valve has different functions for several channels, e.g. the channel 1 zero valve is the channel 2 span valve.

Depending on the gases used, this may allow higher calibration performance.

```
Setup..
Calibration..
Valve assignment..
```

To do so, enter the SETUP - CALIBRATION - VALVE ASSIGNMENT menu:

```
Component ?
```

Multi-channel unit:

Select the component to be set in the SELECT COMPONENT menu.

```
  Valve assignment

Zerogas:            V1
Spangas:            V2
```

Configure the valves to be used for the selected channel.

Available options:

V1 ... V8

Note!

Entries in this lines are not checked to be proper: The user has to ensure not to configure a valve that has not been installed!

Multi-channel unit:

Press the ← key to enter the SELECT COMPONENT menu to change the settings for a different channel.

7.4.1.1.4 Purge Time Setup

```
Setup..
Calibration..
```

```
Calibration gases...
Tol.Check:          Off
Hold on cal:         On
▼Purge time:       15 s
```

Last but not least valve supported calibration procedures require a purge time to be specified:

When gas flow is controlled by internal or external valves, these allow the appropriate calibration gas to flow into the unit as soon as the calibration procedure is started. Due to the limited gas flow and the distance between valves and measuring cell, some time is required before the measuring cell is filled with the calibration gas: this is the purge time, which is to be entered here. If the calibration is started earlier, the gas lines will still contain other components and the calibration will be inaccurate.

The operator has to enter this purge time for his specific system into the related line in this menu.

Note!

Regardless of how many valves are installed, only one single purge time can be specified!

Enter the longest time applicable to any of the installed valves!

7.4 Calibration Procedures

From the table below, in the first column select your preferred the calibration procedure, and notice the information in the columns aside.

Proper configuration and performing of calibrations is essential to keep the functionality of your analyzer. Therefore, to avoid miscalibrations, several menus can be locked by access codes.

Descriptions in subsequent sections do not care about locking of menus.

Information about locking menus are provided in chapter 6.

Type of Procedure	Menu Page (CONTROL -)	Valves	Simulta-neously Calibrated Channels	More Information ☞
Manual calibration	ZERO CALIBRATION...	optional	single channel	page 7-18
	SPAN CALIBRATION...			
Advanced calibration	ADV.CALIBRATION - ZEROALL!	required	all channels	page 7-21
	ADV.CALIBRATION - SPANALL!			
	ADV.CALIBRATION - ZSCALALL!			
Remote calibration	n.a. (via Modbus or Dig IN)	recommended	all channels	page 7-32
Unattended calibration	n.a. (via interval time)	required	all channels	page 7-37

7.4.2 Manual Calibration

Control..

Starting from the measurement screen press the DOWN key to open the MAIN MENU and enter the CONTROL.. menu.

```
Zero calibration..
Span calibration..
Adv.Calibration..
▼Apply gas..
```

To start a zero calibration select the first line:

7.4.2.1 Manual Zero Calibration

Component ?

Multi-channel unit:
Select the channel to be calibrated in the SELECT COMPONENT menu.

Before selecting any further line make sure the required calibration gas is applied and flowing!

Supply all calibration gases with the same flow as the sample gas (recommeded approx. 1 l/min), pressureless and utilizing the right gas fitting (☞ 3.4).

Ensure the warm-up time after switching on has elapsed! Warm-up time is 15 to 50 minutes depending on installed measuring system and configuration!

```
CANCEL calibration!
START calibration!
ZeroGas     0.000 ppm
▼CO2.1      0.200 ppm
```

The first line gives you the choice to cancel the procedure now.

Select the second line to **start the calibration**.

Line 3 shows the calibration gas setup (here: required zero gas concentration is 0.000 ppm), while line 4 shows the currently measured gas concentration.

7.4.2 Manual Calibration

After having started the calibration, watch the screen for information about the status:

The first lines shows the gas (channel) to be calibrated as well as the currently measured concentration (after zero calibration this value should be set to "0").

```
Gasflow         ZeroGas
CO2.1       0.500 ppm
Procedure     Zeroing
Time             10 s
```

The line "Procedure" shows what's currently happening (**Zeroing** = calibration ongoing; **Purging** = waiting for measuring system to be filled with currently flowing gas**;** **None** = calibration finished), while the last line shows the remaining time till end of calibration (countdown starting from 40 seconds).

When finished press the LEFT key two times to return to **either**

the SELECT COMPONENT menu (multi channel analyzer only), select another channel to perform the steps described above to zero calibrate this channel, too,

or

the CONTROL.. menu, which allows you to start a span calibration. The procedure and screens look similiar to those of a zero calibration:

7.4.2.2 Manual Span Calibration

Select SPAN CALIBRATION...

Component ?

Multi-channel unit:
Select the channel to be calibrated in the SELECT COMPONENT menu.

Before selecting any further line make sure the required calibration gas is applied and flowing!

The first line gives you the choice to immediately cancel the procedure.

Select the second line to **start the calibration**.

```
CANCEL calibration!
START calibration!
SpanGas   20.000 ppm
▼CO2.1    16.200 ppm
```

Line 3 shows the calibration gas setup (here: required span gas concentration is 20 ppm), while line 4 shows the currently measured gas concentration.

7.4.2 Manual Calibration

```
Gasflow        SpanGas
CO2.1      20.000 ppm
Procedure   Spanning
Time            10 s
```

After having started the calibration watch the screen for status information:

The display shows the currently flowing gas, the gas (channel) to be calibrated as well as the currently measured concentration (after span calibration it should be set to the expected value) and a countdown for the current procedure:

The line "Procedure" shows what's currently happening (**Spanning** = calibration ongoing; **Purging** = waiting for measuring system to be filled with currently flowing gas**; None** = calibration finished), while the last line shows the remaining time till end of calibration (countdown starting from 40 seconds).

When finished, either press

the LEFT key two times to return to the SELECT COMPONENT menu (multi channel analyzer only), select another channel and perform the steps described above to zero calibrate this channel, too,

or

the HOME key to return to the measurement screen to finish with manual calibration procedures.

7.4.3 Advanced Calibration

Standard manual calibration procedures offer limited funtionality:

To zero and span calibrate a multi channel instrument the operator has to manually start 4 procedures in proper sequence. In addition he has to stay at the instrument to see when the one sequence has finished and to start the following.

The same is applicable for a single channel instrument, when the operator wants to perform both zero and span calibrations.

To improve even manual calibration procedures, X-STREAM analyzers offer a new ADVANCED CALIBRATION menu: It allows single key activation for

- zero calibration of all channels of an analyzer
- span calibration of all channels of an analyzer
- zero **and** span calibration of all channels of an analyzer

(Although advanced calibration offers most advantages for multi channel instruments, it may be used for single channel analyzers as well, that is to activate zero **and** span calibration for the one channel by a single key press.)

The only precondition for making use of this new feature is to have internal and/or external valves installed and properly assigned (☞ 7.3.1.1, page 7.7..

For a description of how to perform

all channel zero calibrations ☞ 7.4.3.1, page 7-22

all channel span calibrations ☞ 7.4.3.2, page 7-25

all channel zero & span calibrations ☞ 7.4.3.3, page 7-28

7.4.3 Advanced Calibration

7.4.3.1 Zero All Calibration

Before selecting any further line make sure the required calibration gas is applied!

Supply all calibration gases with the same flow as the sample gas (recommeded approx. 1 l/min), pressureless and utilizing the right gas fitting (☞ sect. 3.4).

Make sure the purge time is set to a value ensuring the measuring cell is filled properly with the related calibration gas after the valve has opened!

Ensure the warmup time after switching on has elapsed! Warmup time is 15 to 50 minutes depending on installed measuring system and configuration!

```
Control..
Adv. Calibration..
```

Starting from the measurement screen press the DOWN key to open the MAIN MENU and enter the CONTROL - ADV.CALIBRATION menu.

```
Cancel calibration!
ZeroAll!
SpanAll!
ZeroSpanAll!
```

To start a ZERO calibration for ALL channels select the second line.

Note!

Single channel analyzers show the same menu, with the restriction, that the term "ALL" relates to the single channel only!

7.4.3 Advanced Calibration

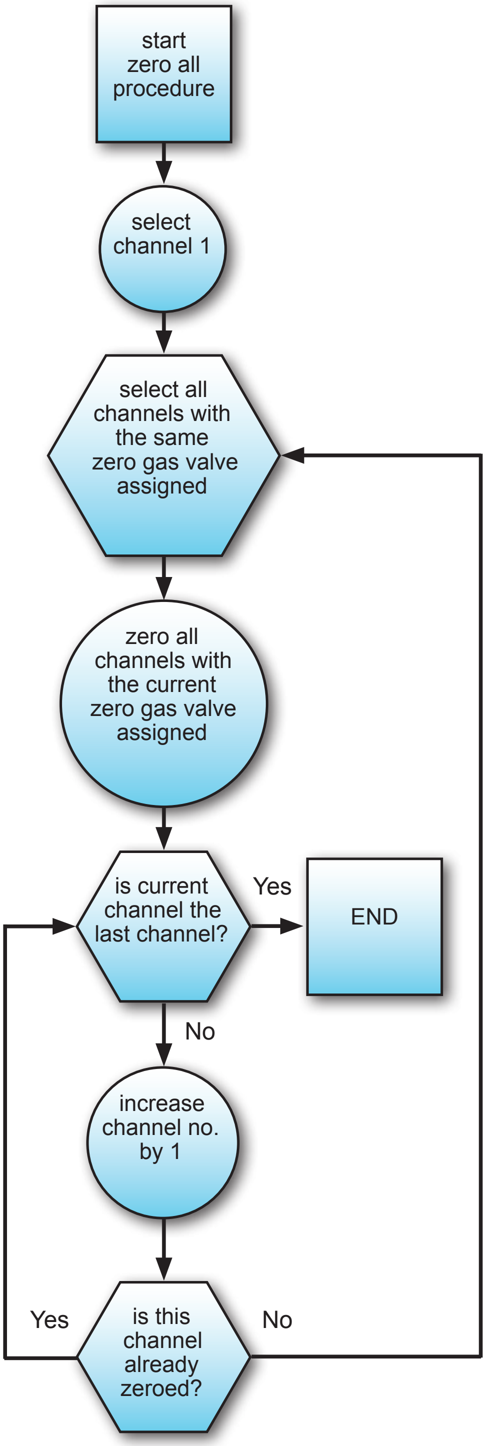


Fig. 7-4: Zero All Calibration Procedure Flow Chart

7.4.3 Advanced Calibration

The analyzer immediately begins zero calibration(s). Watch the screen for status information (in the following explained by means of exemplary figures).

```
Gasflow                V4

Procedure         Purging
Time                 10 s
```

The procedure starts showing the screen to the left, indicating that valve **V4** is open. Currently the system is **purged** (prepurge) to ensure it is properly filled with zero gas when zero calculation starts. Here the remaining purge time is **10** seconds (decreasing from the value entered in the calibration setup screen, ☞ page 7-14).

```
Gasflow                V4

Procedure         Zeroing
Time                 38 s
```

When the prepurge time has elapsed, the instrument starts to calculate the zero point (indicated by the term **Zeroing**): Zero gas is still applied, the count down starts at 40 s.

Note!

Multi channel instruments zeroing more than 1 channel at a time, show "Zeroing" in the procedure line while calibration is ongoing. To see which channels are currently calibrated, see the status line in the measuring screen.

```
Gasflow            Sample
CO2.1           0.000 ppm
Procedure         Purging
Time                 10 s
```

After zero calibration has finished, the instrument closes the zero gas valve and opens the sample gas valve. Now a postpurge procedure starts to indicate that proper sample gas measurement values require the system to be filled with the related gas only. Postpurge time is purge time plus 2x damping time as entered in the calibration setup (☞ page 7-14) and measurement setup (☞ page 6-29).

The zero calibration procedure has finished when the last time interval shows remaining **0 seconds** and the gas flow is **sample**.

Now press

either the LEFT key to return to the advanced calibration menu to select another calibration procedure

or the HOME key to return to the measuring screen.

7.4.3 Advanced Calibration

7.4.3.2 Span All Calibrations

Before selecting any further line make sure the required calibration gas is applied!

Supply all calibration gases with the same flow as the sample gas (recommeded approx. 1 l/min), pressureless and utilizing the right gas fitting (☞ sect. 3.4).

Make sure the purge time is set to a value ensuring the measuring cell is filled properly with the related calibration gas after the valve has opened!

Ensure the warmup time after switching on has elapsed! Warmup time is 15 to 50 minutes depending on installed measuring system and configuration!

```
Control..
Adv. Calibration..
```

Starting from the measurement screen press the DOWN key to open the MAIN MENU and enter the CONTROL - ADV.CALIBRATION menu.

```
Cancel calibration!
ZeroAll!
SpanAll!
ZeroSpanAll!
```

To start a SPAN calibration for ALL channels select the third line.

Note!

Single channel analyzers show the same menu, with the restriction, that the term "ALL" relates to the single channel only!

7.4.3 Advanced Calibration

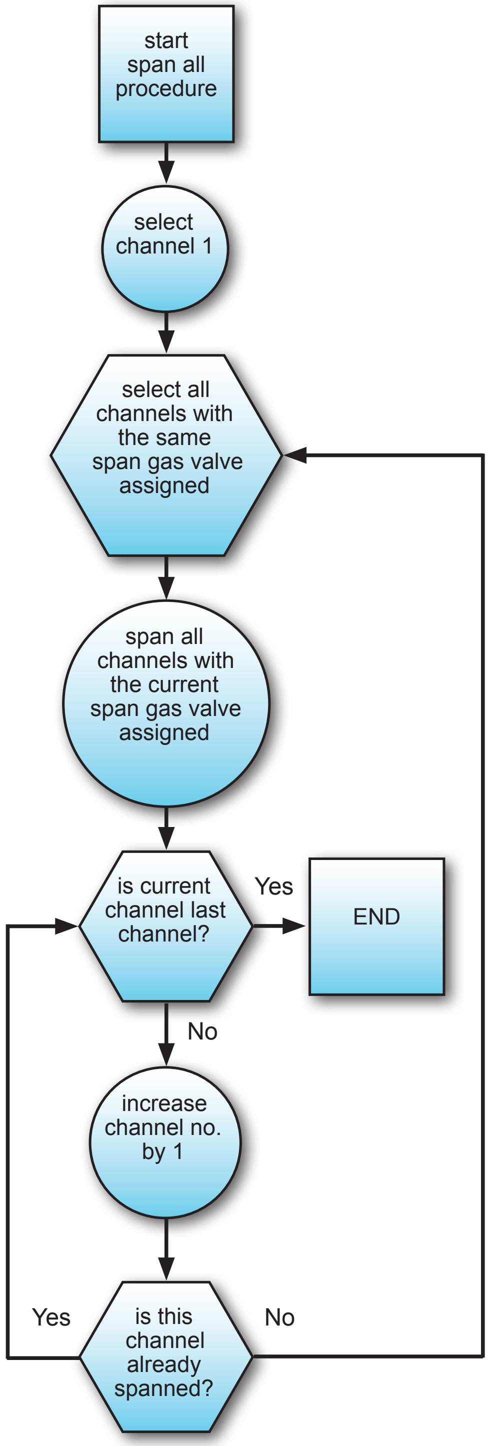


Fig. 7-5: Span All Calibration Procedure Flow Diagram

7.4.3 Advanced Calibration

The analyzer immediately begins span calibration(s). Watch the screen for status information (in the following explained by means of exemplary figures).

```
Gasflow              V4

Procedure       Purging
Time               10 s
```

The procedure starts showing the screen to the left, indicating that valve **V4** is open. Currently the system is **purged** (prepurge) to ensure it is properly filled with span gas when span calculation starts. Here the remaining purge time is **10** seconds (decreasing from the value entered in the calibration setup screen, page 7-14).

```
Gasflow              V4

Procedure      Spanning
Time               38 s
```

When the prepurge time has elapsed, the instrument starts to calculate the span point (indicated by the term **Spanning**): Span gas is still applied, the count down starts at 40 s.

Note!

*Multi channel instruments spanning more than 1 channel at a time, show **Spanning** in the "procedure" line while calibration is ongoing. To see which channels are currently calibrated, see the status line in the measuring screen.*

```
Gasflow          Sample
CO2.1         0.000 ppm
Procedure       Purging
Time               10 s
```

After span calibration has finished, the instrument closes the span gas valve and opens the sample gas valve. Now a postpurge procedure starts to indicate that proper sample gas measurement values require the system to be filled with the related gas only. Postpurge time is purge time plus 2x damping time as entered in the calibration setup (page 7-14) and measurement setup (page 6-29).

The span calibration procedure has finished when the last time interval shows remaining **0 seconds** and the gas flow is **sample**.

Now press

either the LEFT key to return to the advanced calibration menu to select another calibration procedure

or the HOME key to return to the measuring screen.

7.4.3.3 Zero & Span All Calibration

Before selecting any further line make sure the required calibration gas is applied!

Supply all calibration gases with the same flow as the sample gas (recommeded approx. 1 l/min), pressureless and utilizing the right gas fitting (see sect. 3-4).

Make sure the calibration purge time is set to a value ensuring the measuring cell is filled properly with the related calibration gas after the valve has opened!

Ensure the warmup time after switching on has elapsed!
Warmup time is 15 to 50 minutes depending on installed measuring system and configuration!

```
Control..
Adv. Calibration..
```

Starting from the measurement screen press the DOWN key to open the MAIN MENU and enter the CONTROL - ADV.CALIBRATION menu.

```
Cancel calibration!
ZeroAll!
SpanAll!
ZeroSpanAll!
```

To start a ZERO & SPAN calibration for ALL channels select the last line.

Note!

Single channel analyzers show the same menu, with the restriction, that the term "ALL" relates to the single channel only!

7.4.3 Advanced Calibration

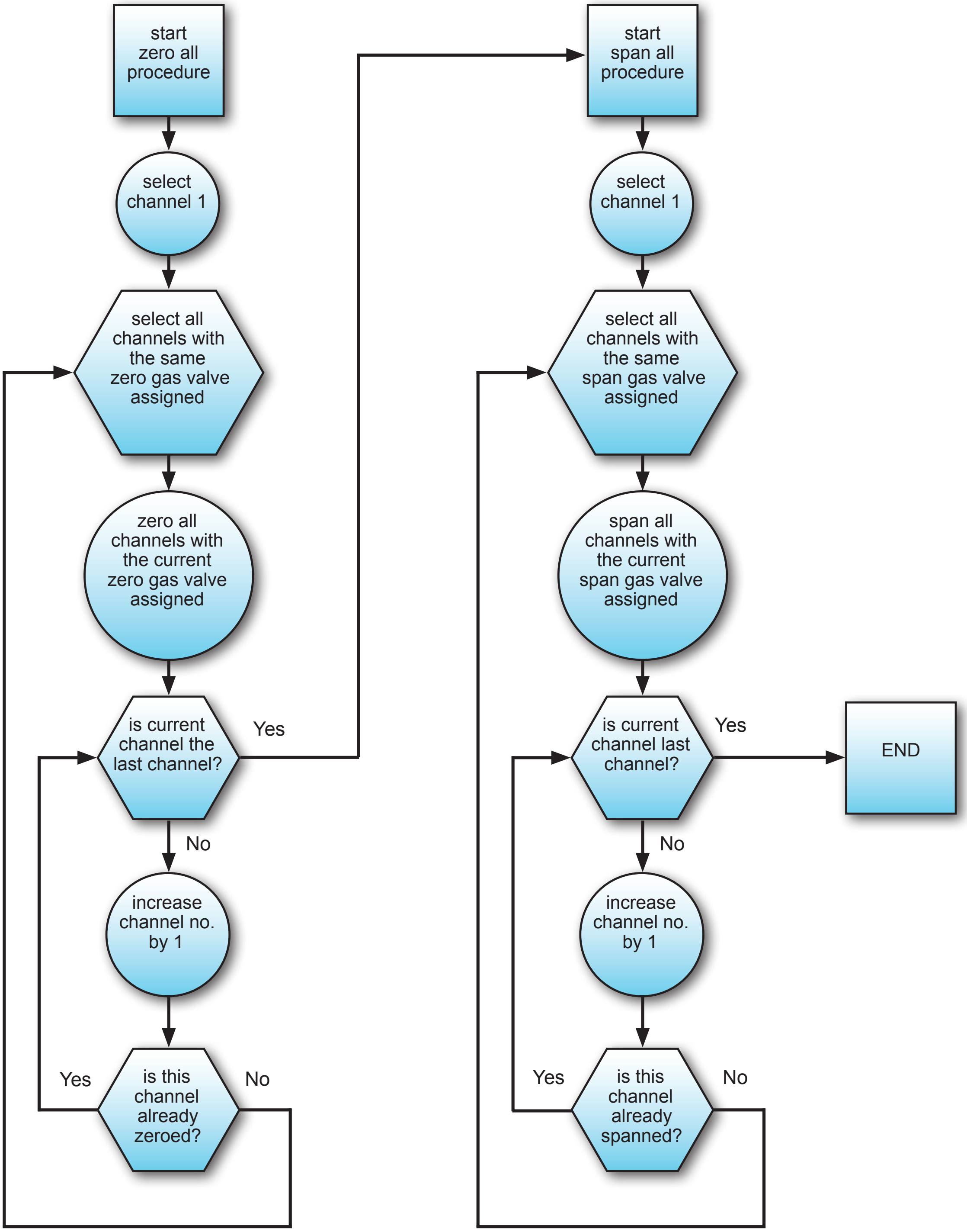


Fig. 7-6: Zero Span All Calibration Procedure Flow Diagram

7.4.3 Advanced Calibration

This procedure is just a combination of the two described before: At the beginning all channels are zeroed and then all channels are spanned: Watch the screen for status information (in the following explained by means of exemplary figures; valve designators for example only).

```
Gasflow              V4

Procedure      Purging
Time              10 s
```

The first screen appearing shows that valve V4 is open. Currently the system is purged (prepurge) to ensure it is properly filled with span gas when span calculation is started. Here the remaining purge time is **10** seconds (decreasing from the value entered in the calibration setup screen, ☞ page 7-14).

```
Gasflow              V4

Procedure      Zeroing
Time              29 s
```

When the prepurge time has elapsed, the instrument starts to calculate the zero point (here indicated by the procedure term **Zeroing**) for all channels with the same zero gas valve assigned: Zero gas is still applied, the time count down starts at 40 s.

Note!

*Multi channel instruments zeroing more than 1 channel at a time, show **Zeroing** in the procedure line while calibration is ongoing. To see which channels are currently calibrated, see the status line in the measuring screen.*

Now the instrument is checked for additional channels not yet zero calibrated and if there are any, the procedure begins again with the first step as described at the top of this page, now with another valve (zero gas).

Once all channels are zero calibrated, automatically a span calibrate all channels procedure is started:

7.4.3 Advanced Calibration

```
Gasflow               V2

Procedure       Purging
Time               10 s
```

The procedure starts showing the screen to the left, indicating that valve **V2** is open. Currently the system is **purged** (prepurge) to ensure it is properly filled with span gas when span calculation starts. Here the remaining purge time is **10** seconds (decreasing from the value entered in the calibration setup screen, ☞ page 7-14).

```
Gasflow               V2

Procedure      Spanning
Time               38 s
```

When the prepurge time has elapsed, the instrument starts to calculate the span point (indicated by the term **Spanning**): Span gas is still applied, the count down starts at 40 s.

Note!

*Multi channel instruments spanning more than 1 channel at a time, show **Spanning** in the procedure line while calibration is ongoing. To see which channels are currently calibrated, see the status line in the measuring screen.*

After this calibration has finished, the instrument is checked for additional channels not yet span calibrated and if there are any, the procedure starts again with the first step as described at the top of this page, now with another span gas valve.

```
Gasflow           Sample
CO2.1          0.000 ppm
Procedure        Purging
Time                10 s
```

After span calibrations have finished, the instrument closes all span gas valves and opens the sample gas valve. Now a postpurge procedure starts to indicate that proper sample gas measurement values require the system to be filled with the related gas only. Postpurge time is purge time plus 2x damping time as entered in the calibration setup (☞ page 7-14) and measurement setup (☞ page 6-29).

The span calibration procedure has finished when the last time interval shows remaining **0 seconds** and the gas flow is **sample**.

Now press the HOME key to return to the measuring screen.

7.4.4 Remote Calibration

Remote calibrations may be initialized by digital inputs or Modbus commands, whereas both offer different functionalities:

Remote calibration via **digital inputs** (option) is feasible only in combination with internal or external valves and is limited to 3 procedures, to be assigned to any digital input: Zero calibrate all channels (ZeroAll), span calibrate all channels (SpanAll) and zero & span calibrate all channels (ZSCalAll).

Note!

By activating span calibrations, it is the operators responsibility to not perform a span calibration without a preceding zero calibration!

The **Modbus interface** offers more variability in performing calibrations:

- Calibration without valves:

  The Modbus command initializes the procedure within the analyzer, but the operator has to take care that the gases are supplied in proper order, has to consider purge times as well as the condition to not perform a span calibration without a preceding zero calibration. So, in this configuration Modbus may be used e.g. together with an external sample handling system that controls the gas flow.

- Calibration with valves:

  Installed and assigned valves (☞ 7.3.1.1, page 7-19) support two different variations of how to perform calibrations:

  1. Perform single calibrations

     The Modbus command initializes single procedures (zero or span calibrations). The analyzers controls gas supply and purge times while it is the operators responsibility to not activate a span calibration without a preceding zero calibration!

  2. Special calibration procedures:

     • Zero calibrate all channels

     • Span calibrate all channels

     • Zero & span calibrate all channel.

     Initialized by the Modbus command the analyzer performs above mentioned procedures and controls gas supply, purge times and (for the last given procedure only) performs a zero calibration for all channels before activating span calibrations.

For detailled descriptions on how to perform

calibrations initialized via digital inputs	☞	7.4.4.1, page 7-30
calibrations initialized via Modbus, without valves	☞	7.4.4.2, page 7-32
calibrations initialized via Modbus, with valves	☞	7.4.4.3, page 7-33

7.4.4 Remote Calibrations

7.4.4.1 Calibrations Initialized Via Digital Inputs

As already mentioned, the analyzer must either provide internal valves or external valves (connected to its digital outputs), to make use of this feature.

☞ Chapter 4 for information about electrical data and installation of digital inputs and outputs.

Depending on the assigned function, digital inputs are either edged triggered or level triggered and have different priority classes:

Assigned Function	Trigger Mode	Priority Class	Priority inside Class
Cancel Calibration [1)]	edge triggered	I	"Cancel Calibration" has the highest priority within this class. For the other function applies: Whichever signal is applied first activates the related function
ZeroAll			
SpanAll			
ZSCalAll			
V1 ... V8, sample [2)]	level triggered	II	"V1" has highest priority, decreasing to "sample" with lowest priority
Pump [3)]	level triggered	*(none)*	these signals may be applied in parallel to all other signals, including those of other priority classes
Zoom1 ... Zoom4			

1) 2) 3) see paragraphs below

Tab. 7-1: Digital Inputs Priorities

Signals of priority class **I** are of higher priority as the signals of class **II**: if any valve is activated by a digital input, the moment a calibration is started by another digital input, this input (better: the related procedure) takes control of the valves.

Beside this, there are some more conditions to observe (see notes in table 7-3):

1) "Cancel Calibration" has an effect on ongoing calibrations only: Applying a signal without a calibration ongoing does not work as an inhibit signal for future calibration signals.

2) The sample valve is activated, if no other valve (V1 ... V8) is activated, AND
   - the sample valve is NOT assigned a digital input (auto ON)

     OR
   - the sample valve is assigned a digital input and this input is activated.

3) If a digital input is assigned to **Pump**, this pump is controlled by this digital input ONLY, not any longer by the software menu. If ALL valves are closed, the pump is always switched off automatically, regardless of how it is controlled.

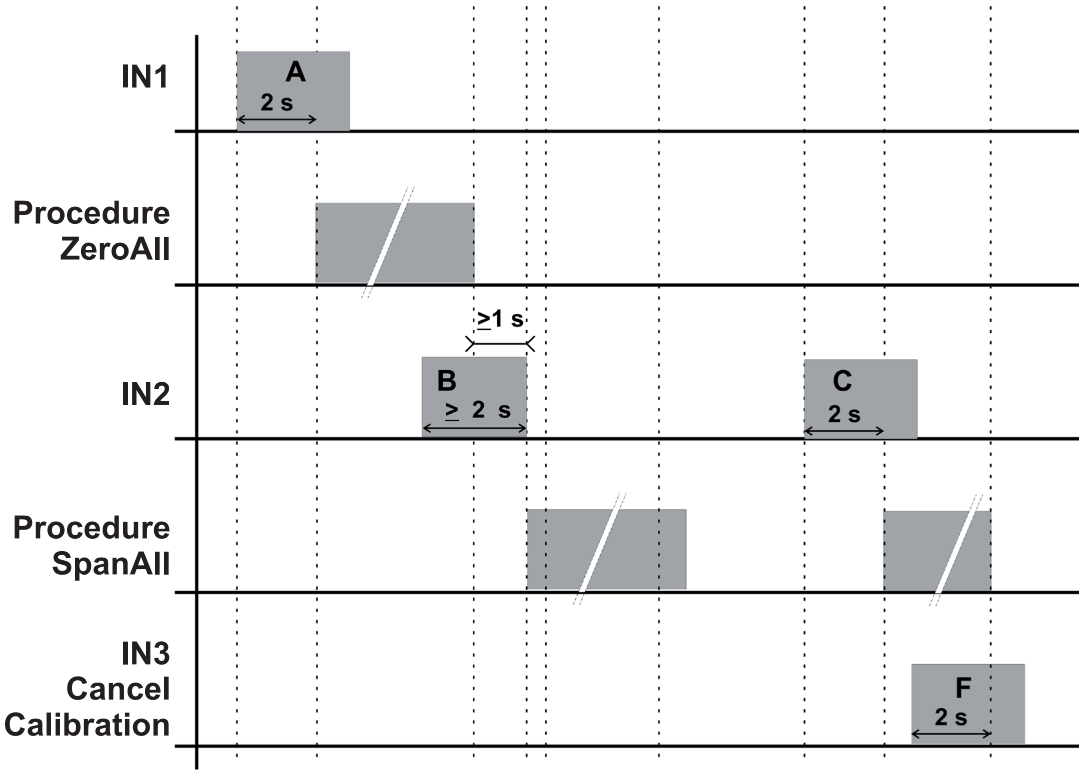
7.4.4 Remote Calibrations

In the following configuration input IN1 starts a ZeroAll calibration, IN2 a SpanAll calibration and IN3 is assigned "Cancel Calibration".

The related procedure is initialized by a rising edge, subsequently followed by a signal with a duration of at minimum 2 seconds.

Additional triggers applied to any inputs during an ongoing calibration are considered only, if the subsequent signal is still applied for at minimum 1 second, after the ongoing procedure has finished.

Multiple triggers applied to several calibration related inputs at the same time are evaluated in relation to their order of application: The first signal applied is the first one evaluated.



Example 1:

Signal A starts a ZeroAll calibration

Signal B is applied during the ongoing ZeroAll calibration. It ends more than 1 sec after the calibration is finished, so the related SpanAll calibration is initialized.

Example 2:

Signal C initializes a SpanAll calibration.

Signal F is applied during the ongoing procedure and cancels it after the minimum 2 seconds duration.

Fig. 7-7: Digital Inputs - Initializing Calibrations

7.4.4.2 Modbus Activated Calibrations Without Valves

Several Modbus commands allow to start calibrations (☞ Chapter 9, List of Modbus Commands).

If the analyzer does neither provide internal valves nor digital inputs and outputs (for controlling external valves), then the procedure corresponds to the manual calibration, with the Modbus commands replacing the manual front panel button keypresses.

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 gas. If applicable, he also has to take care to not activate a span calibration without a preceding zero calibration.

For detailled instructions about manual calibration ☞ 7.3.2, page 7-15.

7.4.4.3 Modbus Activated Calibrations With Valves

Several Modbus commands allow to start calibrations (☞ Chapter 9, List of Modbus Commands).

If the analyzer provides either internal valves or digital inputs and outputs (for controlling external valves), then Modbus commands allow to make use of all the options described in section 7.3.3 "Advanced Calibration" (page 7-18), with the Modbus commands replacing the manual front panel button keypresses.

This means, Modbus commands can initialize

- Zero calibrate all channels
- Span calibrate all channels
- Zero and span calibrate all channels.

The analyzer controls the gas flow, if applicable optimizes the sequence of multiple calibrations and takes care to not activate a span calibration without a preceding zero calibration.

7.4.5 Unattended Automatic Calibration

The unattended automatic calibration feature allows to program the analyzer to automatically perform valve supported calibration procedures without the need of digital inputs or Modbus interface connections.

Compared to the procedures described in the section before (advanced calibration) there are only very limited options, comparable to the manual calibration procedures: The operator has the simple choice of programming zero, or zero and span calibration intervals.

The main features compared to single autocalibrations as described in sections 7-22 and 7-25 are:

1) the time, a calibration starts is defined by an interval time,
2) starting and processing calibrations does not need operator interaction
3) for span calibrations the analyzer considers the requirement that always a zero calibration has to be carried out first,
4) (multi channel instruments only): Every time an unattended calibration is started, it is carried out for all channels!

Before selecting any further line make sure the required calibration gases are applied, and valves are assigned properly!

Supply all calibration gases with the same flow as the sample gas (recommeded approx. 1 l/min), pressureless and utilizing the right gas fittings (☞ sect. 3.4).

Make sure the calibration purge time is set to a value ensuring the measuring cell is filled properly with the related calibration gas after the valve has opened!

Ensure the warm-up time after switching on has elapsed!
Warm-up time is 15 to 50 minutes depending on installed measuring system and configuration!

7.4.5 Unattended Automatic Calibration

```
Setup..
Calibration..
Interval time..
```

```
   Interval time
ZeroAll:          5 h
ZSCalAll:         5 h
AutoCal in..
```

Within the SETUP CALIBRATION menu the INTERVAL TIME.. line opens the following screen:

Two time intervals may be entered:

ZeroAll: This entry specifies intervals for zero calibrations only! If there is an entry for the **ZSCalAll** too, the instrument will carry out additional zero calibrations based on the ZSCalAll interval.

ZSCalAll: This is the interval to elapse before the analyzer automatically starts a **complete calibration procedure** consisting of a zero calibration followed by a span calibration.

Entering **0** disables the related calibration procedure. Setup the time intervals depending on your applicational needs.

By default, the time interval countdown starts when a value is entered. If you want to start the first calibration earlier than the interval specified, enter the menu AUTOCAL IN.

Settings	Diagram	Description
ZeroAll: T1 ZSCalAll: 0		Zero calibrations only; time interval T1
ZeroAll: 0 ZSCalAll: T2		Span calibrations preceded by zero calibrations; time interval T2
ZeroAll: T1 ZSCalAll: T2		Span calibrations, preceded by zero calibrations (time interval T2), and additional zero calibrations (time interval T1)

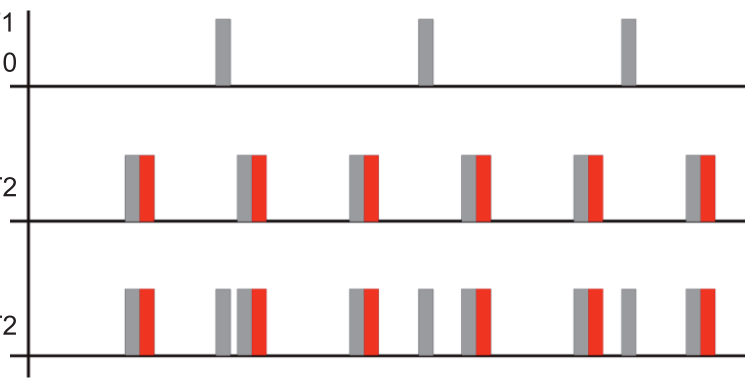


Fig. 7-8: Graphical Explanation of Interval Time Settings

7.4.5 Unattended Automatic Calibration

```
ZeroAll:          1 h
ZeroAll:      15 min
ZSCalAll:          2 h
ZSCalAll:     45 min
```

At first the AUTOCAL IN.. menu serves as an information menu, showing the remaining time till the next calibration procedures are started. The countdowns start the moment, you enter "*interval time*" values in the previous menu.

The second option, this menu offers, is to overwrite the shown values, to activate first calibrations earlier than specified by the "*interval time*" parameter. To do so, just select the related line and enter a new value.

Accepted values:

0 ... interval time (entered in previous menu)

Example:

Current time is: 9:55 a.m.

Interval times are setup at this time to have all channels zeroed in a 12 h interval and all channels zeroed & spanned in a 24 h interval:

```
   Interval time
ZeroAll:        12 h
ZSCalAll:       24 h
AutoCal in..
```

This activates ZeroAll calibrations at

9:55 p.m. and 9:55 a.m. every day

(first calibration takes place at 9:55 ***p.m.*** *the same day)*

and ***ZSCalAll*** *calibrations at*

9:55 a.m. every day

(first procedure carried out the next day).

To have e.g. ZeroAll calibrations take place at 10 a.m. & 10 p.m. and ZSCalAll calibrations in the night at 1:00 a.m., open the AUTOCAL IN.. menu and enter

```
ZeroAll:          0 h
ZeroAll:       5 min
ZSCalAll:        15 h
ZSCalAll:      5 min
```

So, ZeroAll calibrations are carried out at

10:00 a.m. and 10:00 p.m. every day

(but the first calibration now takes place at 10 ***a.m****. the same day!)*

and ***ZSCalAll*** *calibrations are now activated at* ***1:00 a.m. every day****,*

with the first procedure to be carried out early the next day.

7.4.6 Resetting a Calibration

```
CANCEL calibration!
START calibration!
ZeroGas     0.000 ppm
▼CO2.1      0.200 ppm
```

```
▲RESET calibration..


CO2.1       0.200 ppm
```

```
 RESET calibration
   Are you sure?
No!
Yes!
```

In case a wrong configuration was detected after calibration was performed (e.g. wrong gas connected) there is an option to restore the last user saved calibration data:

Within the screen where to start the calibration (either for span or zero) open the second page:

A new screen appears with the option RESET CALIBRATION.. Pressing the ENTER key in this line results in a prompt for confirmation. Choosing YES! replaces the current calibration data with the last calibration data, restored from UserData; ☞ 7.6.2 SAVE-LOAD, page 7-54.

7.4.7 Verifying a Calibration

For instruments **without** internal and/or external valves simply apply either span or zero calibration gas to the sample gas inlet. If the calibration still is proper, the reading on the measurement screen should show the related value.

For instruments **with** internal and/or external valves follow the procedure below:

```
Control..
```

Starting from the measurement screen press the DOWN key to open the MAIN MENU, enter the CONTROL.. menu.

Enter the last line (APPLY GAS..)

```
Zero calibration..
Span calibration..
Adv. calibration..
▼Apply gas..
```

Component ?

Multi-channel unit:

Select the component to be verified in the SELECT COMPONENT menu.

```
Apply gas:   ZeroGas

CO2.1      4.000 ppm
Time              2s
```

Changing the APPLY GAS parameter opens the related valve.

Available options:

SpanGas, ZeroGas, Sample, None.

The "Time" line shows the countdown for the pre-purge or post-purge time (when applying sample gas). When set properly and arrived at "0", the measuring cell is filled with the selected gas and the measuring value (here: CO2; first channel) should show the expected concentration.

7.4.8 Cancelling an Ongoing Calibration

```
CANCEL calibration!
START calibration!
ZeroGas    0.000 ppm
▼CO2.1     0.200 ppm
```

To cancel an ongoing calibration procedure press the LEFT key to bring up the screen where the calibration was started and enter the CANCEL CALIBRATION! line.

Cancelling an ongoing calibration is feasible at any time with the following consequences:

During manual calibration:

Because there are no pre- and postpurge times, cancelling is feasible only during the calibration calculation process. Doing so will reset the calibration data to the data valid before the currently cancelled calibration was started.

During autocalibration:

Cancelling while prepurging or during calibration itself: The status changes showing sample gas to flow and the countdown starts with the postpurge time. Calibration data is reset to the data valid before the currently cancelled calibration was started.

Cancelling during postpurge does not influence the procedure because the new data has already been calculated and stored, and the (post-)purge time cannot be shortened (except by changing the related setup menu parameter).

```
CO2.1       0.000 ppm
Procedure      Zero 1
Time              0 s
```

```
Gasflow       Sample
CO2.1      0.000 ppm
Procedure    Purging
Time            10 s
```

A confirmation popup appears, replaced by the calibration procedure screen, whose content depends on which calibration was cancelled (manual or auto).

Refer to the figures to the left :

The upper screen comes up when a manual calibration was cancelled.

The lower screen shows up when a valve supported calibration was cancelled: The moment, the sample valve was opened, a postpurge procedure was started.

Press the LEFT key to exit these screens.

7.5 Replacing Worn Out Sensors

7.5.1 Safety Instructions

WARNING

ELECTRICAL SHOCK HAZARD

Working at opened and powered instruments means working near live parts and is subject to instructed and trained personnel only!

Take care to observe all applicable safety instructions!

WARNING

HAZARD FROM EXPLOSIVE, FLAMMABLE AND HARMFUL GASES

Before opening gas paths they must be purged with ambient air or neutral gas (N_2) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

CAUTION

ELECTROSTATIC DISCHARGE HAZARD

Working at internal components of electronical and electrical instruments may cause electrostatic discharge (ESD), destroying components!

Working at open instruments is recommended at special workplaces only! If no such workplace is available, at minimum perform the following procedures to not destroy electronic components:

Discharge the electric charge from your body. Do this by touching a device that is grounded electrically (e.g. instruments with earth connectors, heating installations). This should be done periodically when working at open instruments (especially after leaving the service site, because e.g. walking on low conducting floors might cause additional ESD).

7.5.2 Opening X-STREAM Analyzers

7.5.2.1 How to Open X-STREAM X2GP

Remove the top cover after loosening the 12 screws.

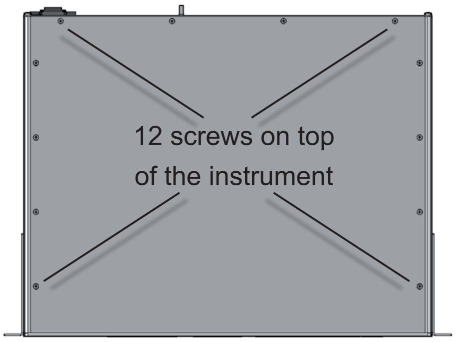
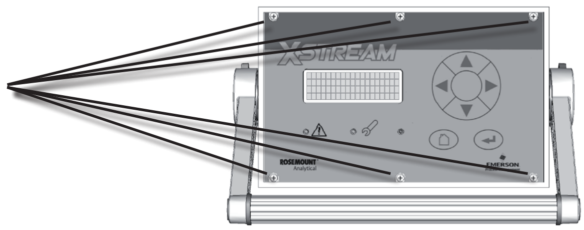


Fig. 7-9: X-STREAM X2GP

7.5.2.2 How to Open X-STREAM X2GK

If your instrument is equipped with a handle

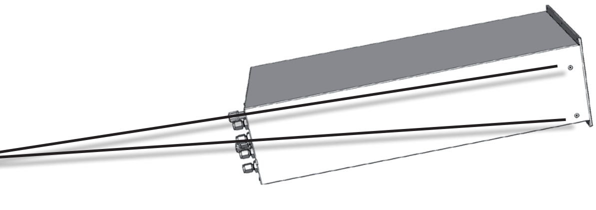
- loosen the 6 screws at the front panel,
- to only get access to the cover screws, push frame and handle about 2 cm / 1" towards the rear.



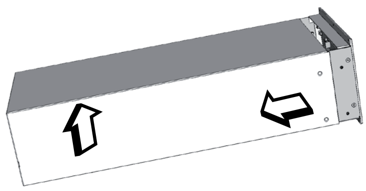
Note!

To completely remove frame and handle, you need to disconnect all gas and electrical connections and push frame and handle over the rear panel.

- remove the 4 screws for the cover, (2 screws on each side of the instrument



- push the cover towards the rear and remove it.



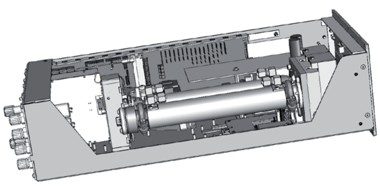


Fig. 7-10: X-STREAM X2GK

7.5.2.3 How to Open X-STREAM Field-housings

Depending on the individual analyzer configuration, either open the upper or lower front door to the left, utilizing the two sash fasteners.

7.5.2.4 How to Open X-STREAM X2FD

To open a X-STREAM X2FD loosen the 20 screws located at the instrument´s flange. Then carefully flip down the front door to not damage the instrument, hinges or equipment installed below the analyzer.

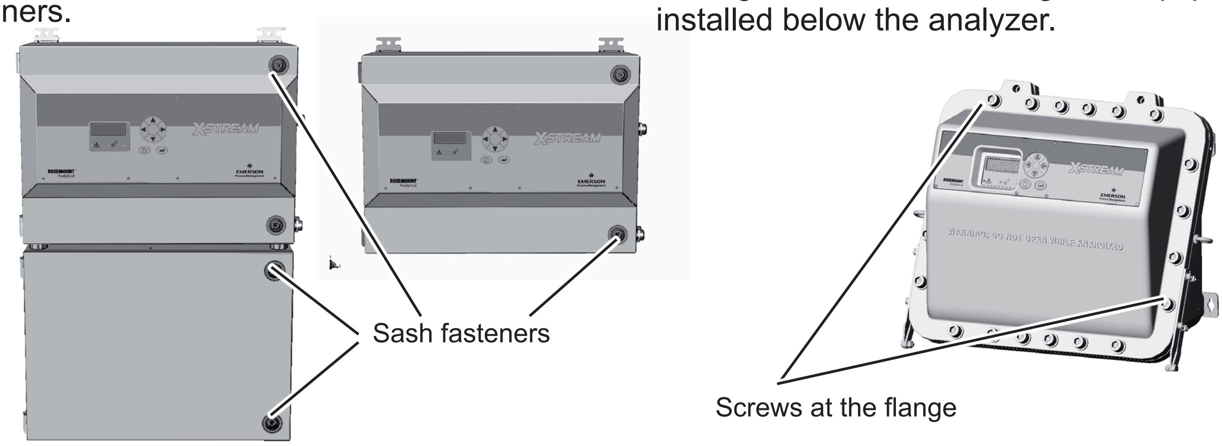


Fig. 7-11: X-STREAM X2 Field Housings and X2FD - How to Open

WARNING

EXPLOSION HAZARD

X-STREAM X2FD as well as special variations of X-STREAM X2XF Field-housings are intended to be installed in hazardous areas.

Maintaining such instruments is permitted only considering special conditions, given in the associated separate manuals.

Do not open nor maintain instruments in hazardous areas without having read and understood all related instruction manuals!

CAUTION

GASKETS AT LOW TEMPERATURES

Consider that enclosure gaskets may be frozen if the instrument is installed outdoors. Carefully open the enclosure at temperatures below -10 °C to not damage the gaskets.

Damaged gaskets void the ingress protection, possibly causing property damage, personal injury or death.

7.5 Replacing Worn Out Sensors

Separate sections describe the replacement of the various sensors:

Electrochemical oxygen sensor	☞ 7.5.3, page 7-46
Trace oxygen sensor (tO_2)	☞ 7.5.4, page 7-53
Trace moisture sensor	☞ 7.5.4, page 7-54

7.5.3 Replacing the Electrochemical Oxygen Sensor

WARNING

HAZARD FROM WEAK ACID AQUEOUS SOLUTION

If the electrolyte leaks due to sensor damage, put the sensor in a plastic bag so that the solution will not be smeared on other places and return the sensor to Emerson Process Management or an industrial waste management contractor.

The electrolyte is a weak acid aqueous solution of 5 to 6 in pH with an irritating odor. It will not ignite spontaneously even if it is left. Nevertheless, lead acetate, which is a component of the solution, is harmful to human bodies and should be handled with care as follows:

- **If electrolyte is smeared on the skin or clothing, immediately wash the contacted part with soapy water and wash off the solution with a large amount of tap water.**
- **If electrolyte gets into an eye, immediately wash the eye with a large amount of tap water for 15 minutes and consult a doctor promptly.**
- **If electrolytic solution or atomized electrolytic solution is inhaled, immediately wash the nostrils and gargle with tap water and consult a doctor promptly.**
- **If electrolyte is swallowed, DO NOT INDUCE VOMITING! Immediately wash the mouth with tap water. Swallow a large amount of tap water. Consult a doctor promptly.**

Do not disassemble or repair the sensor. Removing a sensor part or remodeling the sensor will damage the sensor or leak the electrolyte, and restoration to the original condition may not be possible.

Discarded sensors cause environmental contamination. Return a Worn Out sensor to Emerson Process Management or an industrial waste management contractor when discarding a Worn Out sensor.

7.5 Replacing Worn Out Sensors

GENERAL HINTS ON HANDLING THE SENSOR

Do not expose the sensor to a temperature other than the temperature range of -20 to +60‘C (-4 to +140 F). Exposing to a temperature outside the temperature range may cause abnormal output or leak of the electrolyte due to parts degradation or damage.

Make sure to prevent condensation of the oxygen concentration detecting part. If condensed, the output will lower and response speed will slow down, disabling accurate concentration measurement. The sensor characteristics will return to the original characteristics if condensation moisture evaporates after putting the sensor in dry air several hours to several days.

Do not drop or apply a violent shock or vibration to the sensor. If shocked or vibrated, the sensor output may temporarily vary or become unstable. The original sensor condition will usually reset by putting the sensor in a stationary condition in the atmosphere at a ordinary temperature several hours to several days. Depending on the degree of a shock or vibration, the internal sensor structure may break and the sensor may not return to original condition.

Do not disassemble or repair the sensor. Removing a sensor part or remodeling the sensor will damage the sensor or leak the electrolyte and restoration to the original condition may not be possible.

7.5 Replacing Worn Out Sensors

Consider all applicable safety instructions, especially those at the beginning of this section 7.5

In consequence of it‘s design the sensor‘s lifetime is limited and depends on theoretical designed life and Oxygen concentration. The sensor output can be taken as a rough criterion for end of lifetime: The sensor is worn-out when the output in atmosphere is below 70 % of the initial output. The period till then can be calculated by

$$\textit{Lifetime} = \frac{\textit{designed life (hours)}}{O_2 \textit{ concentration (\%)}}$$

The sensor‘s designed life under constant conditions of 20 °C is approx. **900,000 hrs.**

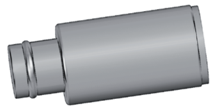
The lifetime at 21 % Oxygen is therefore calcu-lated to approx. **42,857 hrs, corre-sponding to approx. 5 years.**

Irrespective of all calculations above:

A sensor is worn-out if, connected to ambient air, the output voltage is less than 2.8 V: Replace the sensor!

For replacing the electrochemical sensor the following tools are required:

- Philips screw drivers # 0 & 2 for tabletop/ rackmount instruments or square key for the field housing's squash fasteners or allen key for the flameproof analyzer to remove/open the cover/front door.
- Torx screw driver # 10.
- 1 digital volt meter (measuring range 0…2 V dc minimum) with suitable cables and probes.



Note 1!

The given lifetime values are for reference only! The expected lifetime is greatly affected by the temperature of the environment in which the sensor is used or stored. Increases or decreases in atmospheric pressure have the same effect as that by increases or decreases in Oxygen concentration. (Operation at 40 °C halves lifetime).

Note 2!

Due to the measuring principle the electrochemical Oxygen cell requires a minimum internal consumption of Oxygen (residual humidity avoids drying up the cell). Supplying cells continuously with dry sample gas of low grade Oxygen concentration or with sample gas free of Oxygen could result in a reversible detuning of O_2 sensitivity. The output signal will become unstable, but response time remains constant.

For proper measurement results the cell needs to be supplied continuously with concentrations of at least 0.1 Vol.-% O_2.

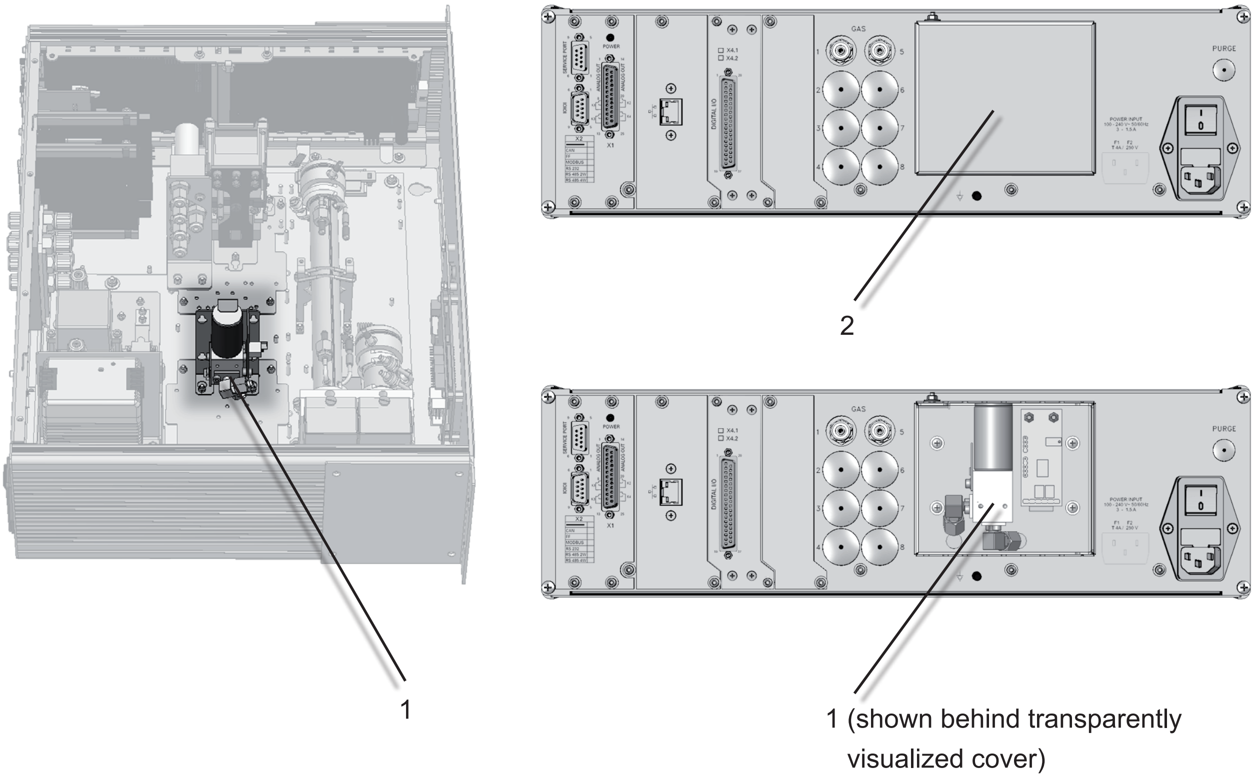
We recommend using the cell if need be in alternating mode, means to purge the cell with conditioned ambient air (not dried, but dust removed) when measurement pauses.

If it is necessary to interrupt Oxygen supply for several hours or days, the cell has to regenerate (supply cell for about one day with ambient air). Temporary flushing with Nitrogen (N_2) for less than 1 h (e.g. for analyzer zeroing purpose) has no influence on measuring characteristics.

7.5.3.1 Locating the Sensor

The instruments provide two different variations of internal designs (except ½19“ instruments):

- In instruments with internal heated box covering the physical components, electrochemical sensors are installed outside this box.
- Instruments without internal thermostatic control have the sensor installed onto the basic mounting plate (see left side of figure 7-12).
- X2GP may also have the electrochemical oxygen sensor installed at the rear panel (see right side of figure 7-12).



1 eO2 sensor Unit
2 Cover for rear panel installation

Fig. 7-12: Location of the EO2 Sensor Unit

If your analyzer features the eO2 sensor at the rear panel, continue with page 7-51.

7.5.3.2 Disassembling the Sensor Unit

The sensor unit consists of a holder, an electronics board and the sensor itself, all together installed on a base plate (Fig. 7-13).

After loosening the nut (5), push the holder (3) with sensor (1) until the nut is above the hole (see details), then lift the holder from the base plate (4). The sensor is still fixed in the holder by means of a clip (8).

Now loosen the screws (7), fixing the sensor block (6) to the holder, push the holder downwards until the screws heads slip through the holes.

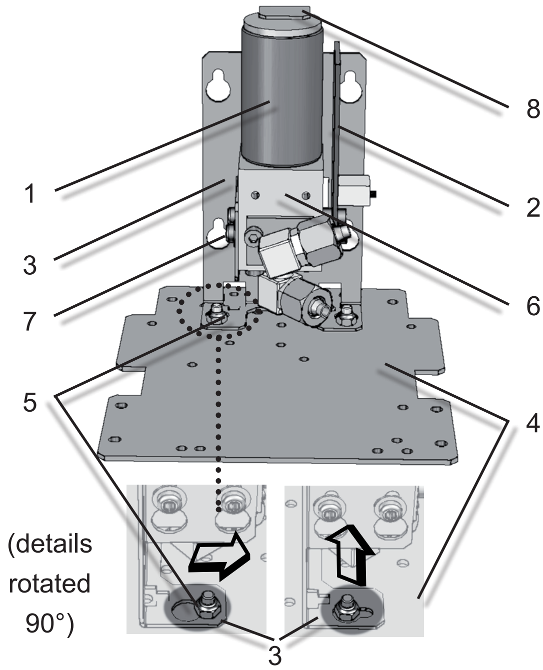
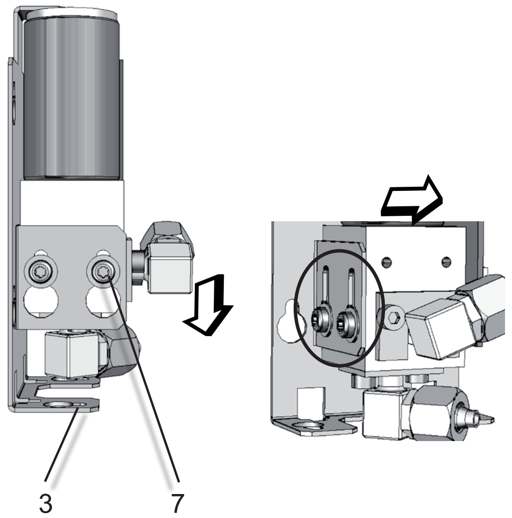


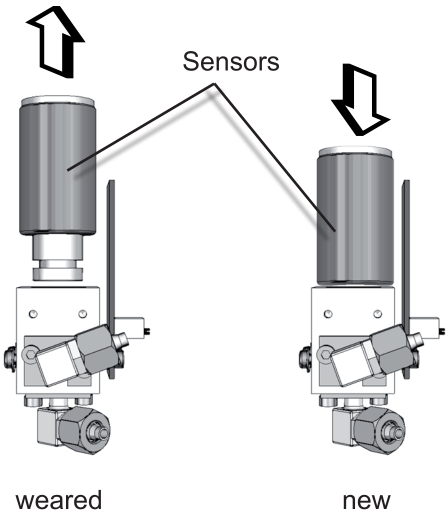
Fig. 7-13: Sensor Unit Design

1 Sensor
2 Electronics Board
3 Holder
4 Base Plate
5 Nuts
6 Sensor block
7 Screws
8 Clip



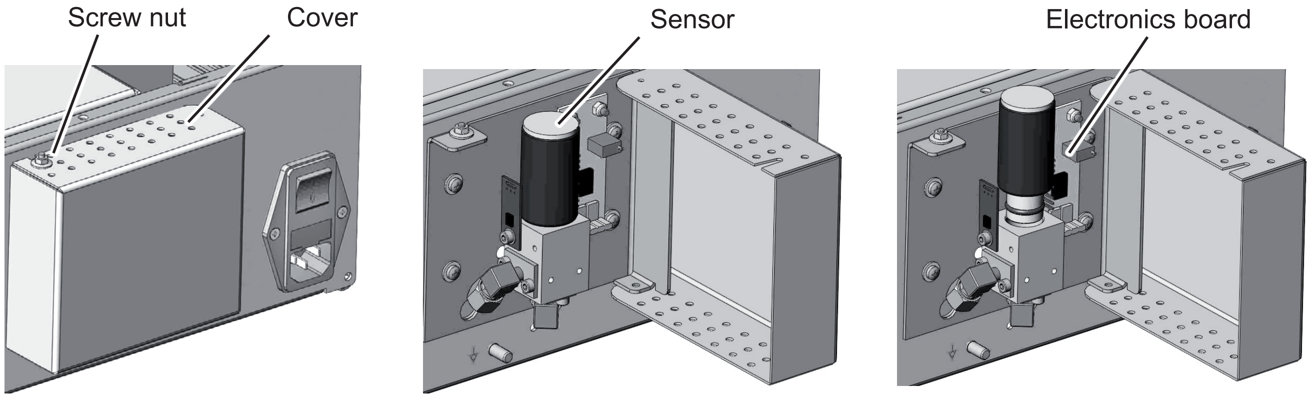
Pull off the signal connector from the electronics board (2) and take off the sensor.

Take a new sensor, remove its plug, insert the sensor into the block and connect the signal connector to P2 on the electronics board (Fig. 7-14).



Now re-assemble the sensor unit in reverse order, but do not yet install it into the analyzer as it requires a signal adjustment.

Replacing the sensor if rear panel installed



1. Loosen the screw nut at the cover's upper side.
2. Open the cover to get access to the sensor.
3. Take out the sensor by pulling it upwards.
4. Properly insert the new sensor into the block.

Fig. 7-14: Sensor At Rear Panel

7.5.3.3 Adjusting the Output Signal

Consider all applicable safety instructions, especially those at the beginning of this section 7.5

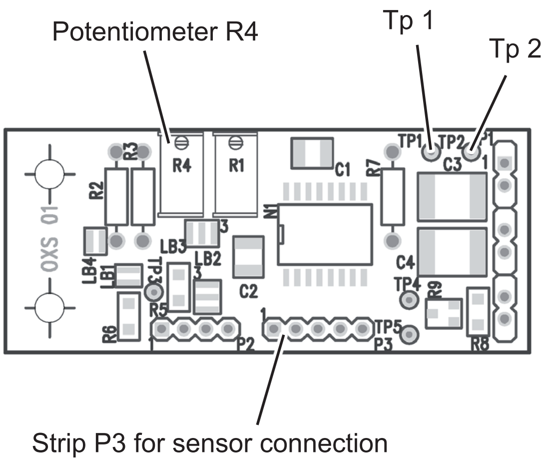


Fig. 7-15: OXS Board, Top View

Having replaced the worn sensor, the board´s output signal requires some adjustment.

Procedure:

- power on the open instrument.
- Supply ambient air (approx. 21 % O_2)
- Connect a digital voltmeter (DVM) to Tp 1 (signal) and Tp 2 (GND) on the electronics board OXS (fig. 7-14).
- Adjust the measured signal to 3360 mV DC (± 5 mV) utilizing the potentiometer R4 on OXS board.

Note!

Once the output signal has been adjusted for a specific sensor, further changing the potentiometer settings will cause incorrect measuring results!

7.5.3.4 Finalizing the Sensor Replacement

- Disconnect the analyzer from power
- Re-install the sensor unit into the analyzer
- Close the housing. Take care to use all screws, especially if the instrument is to be used in hazardous areas!

  or

  close the rear panel cover and secure it with the screw nut.

WARNING

EXPLOSION HAZARD

Special conditions and instructions for start-up after maintenance apply to instruments to be operated in hazardous areas!

Not observing these conditions and instructions may cause explosions!

See the associated manuals, provided with instruments for use in hazardous areas, for more information.

In a next step for proper measuring results, perform a zero and a span calibration at least for the channel with the replaced sensor.

To ensure proper disposal, send back the old sensor to the EMERSON Process Management factory (or to your local sales office) or to an industrial waste management contractor for waste disposal.

7.5.4 Replacing the Trace Oxygen Sensor

Replacing the trace oxygen sensor requires considering special instructions, shipped together with every single sensor.

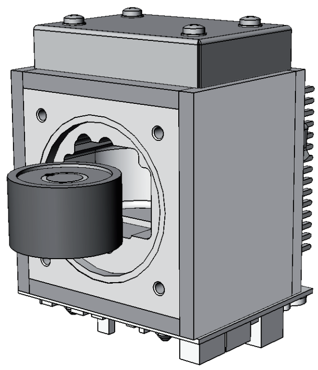
Two versions of this sensor are available, differing in the background gas they can be used for:

P/N 42718102: For sample gases **containing** acid gases, hydrocarbons or hydrogen

P/N 42718103: For sample gases **without** acid gases, hydrocarbons and hydrogen

If replacing this sensor is necessary (consumable), contact Emerson for information on how to order a substitute.

A new sensor will be provided together with detailled installation and handling instructions.



Consider all information given by the replacement instructions to avoid damaging the sensor, and to achieve best possible life time!

7.5.5 Replacing the Trace Moisture Sensor

Consider all applicable safety instructions, especially those at the beginning of this section 7.5

- Locate the sensor unit within your analyzer.
- Open the fittings, connecting the unit to the piping.
- Only loosen the small nuts (do not remove them), fixing the sensor unit to the analyzer plate and carefully take the unit out of the analyzer.
- Take off the signal plug at the sensor's end (it is fixed by a screw!).
- Place a wrench (size: 27 mm) at the hexagon and screw out the sensor by turning it counterclockwise (ccw).

Do not use the cylindric sensor body to losen the sensor!

Place a second wrench with size 30 mm from the top to counterhold the block.

- Take the new sensor and carefully place the HDPE protected end of the sensor into the sensor block.
- Place the one wrench at the hexagon, the other at the block to counterhold and fix the sensor by turning it clockwise (cw).

To ensure proper measurements, apply a torque of min. 30.5 Nm (269 in.lb).

Do not use the cylindric sensor body to install the sensor!

- Install the connector to the sensor and fix it with the screw.
- Place the unit into the analyzer and fix it with the small nuts.
- Re-install the piping fittings.
- Make sure that all the plugs associated with the sensor are properly connected the same way as before.

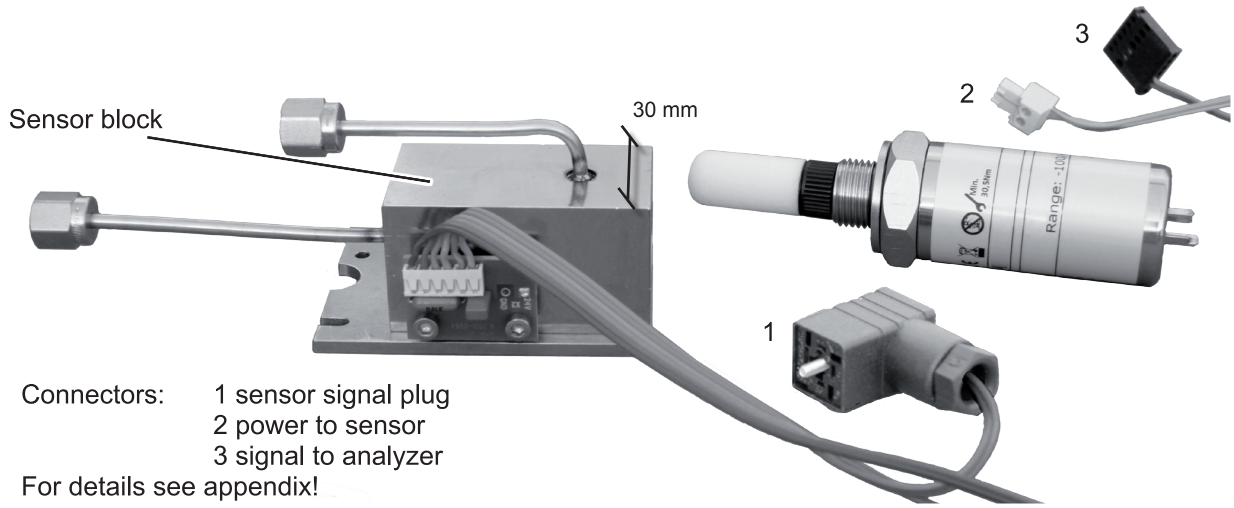


Fig. 7-16: Trace Moisture Sensor Assembly Separated

7.6 Cleaning the Instrument´s Outside

Use a liquid general purpose detergent and a lint-free cloth for cleaning the analyzer´s outside.

WARNING

HAZARD FROM UNHEALTHY SUBSTANCES

Take care to follow the safety instructions and instructions for use given by the manufacturer of the chosen general purpose detergent!

Procedure

- Disconnect the instrument from power!
- If disconnecting from gas lines is required, take care of the following:

WARNING

EXPLOSIVE, FLAMMABLE AND HARMFUL GASES HAZARD

Before opening gas paths they must be purged with ambient air or neutral gas (N_2) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

Seal the open analyzer´s gas fittings utilizing PVC caps to avoid pollution of inner gas path.

- Moisten the lint-free cloth with a mixture of 3 parts of water and 1 part of the general purpose detergent.

Do NOT drench the cloth, just moisten it to prevent liquid entering the housing!

- Clean the analyzer housing outside with the moistened cloth.
- If need be dry the housing after cleaning.

7.7 Save / Restore Configuration Data Sets

After some time of operating the instrument, one can assume all the parameters (calibration gases setup, measuring ranges, inputs and outputs, etc) 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 SAVE-LOAD menus.

X-STREAM analyzers support saving analyzer data by providing 3 different sets of data:

FactData

This is the factory analyzer configuration setup, stored in a FRAM section. The user may only restore this write-protected data into RAM, but not save changed parameters as **FactData**.

CfgData

This current analyzer configuration is stored in a separate FRAM section and used during analyzer operation.

Each time the instrument is powered, a CfgData checksum is calculated. If it appears to be wrong, the **UserData** information is restored into RAM, overwriting **CfgData**. This ensures the instrument remains operable.

UserData

UserData allows the operator to backup and restore his individual analyzer configuration and settings into/from FRAM. Each analyzer is shipped with **CfgData** configured during factory startup and copied to **UserData** and **FactData**.

So, as **CfgData** is overwritten by **UserData** in case of a checksum failure, it is recommended to store the **CfgData** once the instrument is setup to the operator‘s needs, to ensure, the analyzer setup is not lost.

In addition to backup the **CfgData** in internal FRAM memory, the SAVE-LOAD menu allows to save/restore such data to/from an external device (e.g. PC), connected to the service interface (**SvcPort**).

Additional software is required to backup/restore data to/from an external device.

If using a PC, an open source terminal software for MS-Windows™, that may be used for this purpose, is e.g.

UTF-8 TeraTerm Pro with TTSSH2,

downloadable at

http://sourceforge.jp/projects/ttssh2/files.

Note!

Please notice that Emerson Process Management does not provide support for any such software!

7.7 Save / Restore Configuration Data Sets

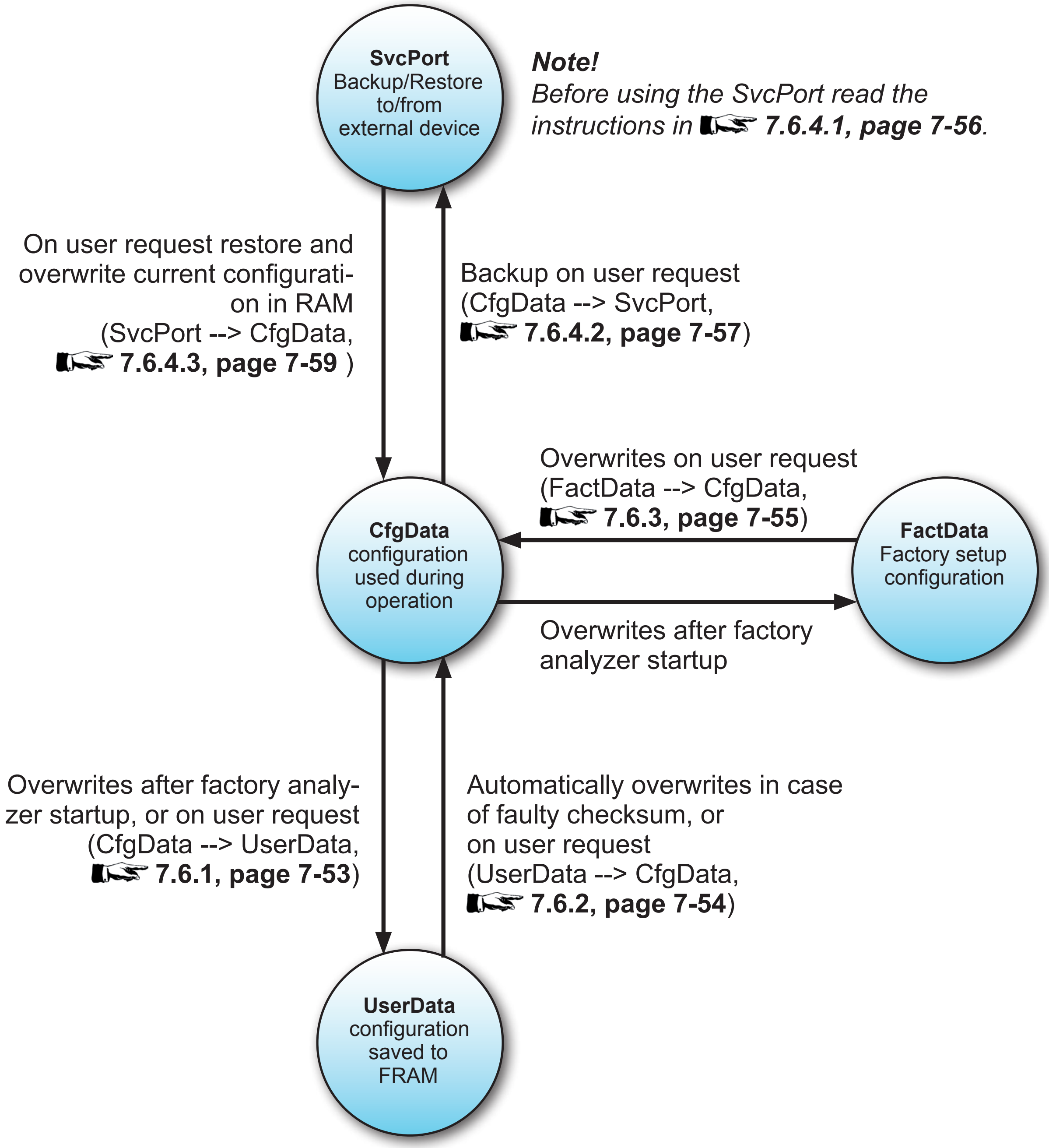


Fig. 7-17: Relationship of Supported Data Sets and Where to Find Further Information

7.7 Save / Restore Configuration Data Sets

7.7.1 Save CfgData to UserData

```
Setup..
Save-Load..
```

Starting at the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP and next the SAVE-LOAD.. menu.

If system is setup accordingly, access level 3 code must be entered to gain access to this menu.

```
      Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

1st menu page

Press the DOWN key to open the second menu page.

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

2nd menu page

Now select the "CfgData>UserData.." line and press the ENTER key.

```
  CfgData>UserData
  Are you sure?
No!
Yes!
```

A screen appears to confirm the operation: Select **Yes!** and after pressing the ENTER key a new screen comes up showing the current status.

The instrument now stores the currently used (and changed by operator) analyzer setup into a special memory area. This data is then called **UserData** and used for backup only, while the data used for operation still is **CfgData**.

```
   Copying data
  - PLEASE WAIT -

Procedure     X:E000
```

Any further changes affecting the instrument's setup update the **CfgData** only, as long as not manually saved to the **UserData** set.

```
         (i)

 -COMMAND EXECUTED-
```

When the procedure has finished, the COMMAND EXECUTED screen shows up.

7.7.2 Restore UserData to CfgData

```
Setup..
Save-Load..
```

Starting at the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP and next the SAVE-LOAD.. menu.

If system is setup accordingly, access level 3 code must be entered to gain access to this menu.

```
      Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

1st menu page

Press the DOWN key to open the second menu page.

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

2nd menu page

Now select the "UserData>CfgData.." line and press the ENTER key.

```
  UserData>CfgData
  Are you sure?
No!
Yes!
```

A screen appears to confirm the operation: Select **Yes!** and after pressing the ENTER key a new screen comes up showing the current status.

The instrument now replaces the currently used (and changed by operator) analyzer setup by the UserData set. All settings changed since the UserData was saved, will be overwritten!

When the procedure has finished, the COMMAND EXECUTED screen shows up for 2 seconds, followed by...

```
         (i)

 -COMMAND EXECUTED-
```

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

... the previous menu page. After a few seconds the analyzer automatically starts to reboot.

7.7.3 Copy FactData to CfgData

```
Setup..
Save-Load..
```

Starting at the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP and next the SAVE-LOAD.. menu.

If system is setup accordingly, access level 3 code must be entered to gain access to this menu.

```
      Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

1st menu page

Press the DOWN key to open the second menu page.

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

2nd menu page

Now select the "FactData>CfgData.." line and press the ENTER key.

```
  FactData>CfgData
  Are you sure?
No!
Yes!
```

A screen appears to confirm the operation: Select **Yes!** and after pressing the ENTER key a new screen comes up showing the current status.

```
         (i)

 -COMMAND EXECUTED-
```

The instrument now replaces the currently used (and changed by operator) analyzer setup by the FactData set. All settings changed by the operator will be overwritten and the instrument setup to the factory settings.

When the procedure has finished, the COMMAND EXECUTED screen shows up for 2 seconds, followed by...

```
▲
FactData > CfgData..
CfgData > UserData..
UserData > CfgData..
```

... the previous menu page. After a few seconds the analyzer automatically starts to reboot.

7.7.4 Save / Restore CfgData to External Device

7.7.4.1 Preparation

Before starting any of these procedures an external device (e.g. computer) has to be connected to the analyzer via the service interface, which is of type **RS232** (Fig. 7-17).

This service interface is NOT optically isolated from the analyzer electronics! Take care to not destroy the electronics by electrostatic discharge or high voltages!

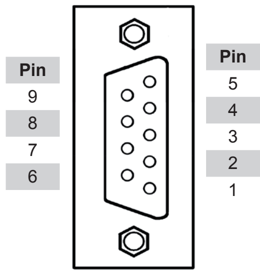
Make sure both devices (computer and analyzer) provide the same type of interface. If need be, use a converter.

Furthermore a terminal software is required to setup a communication. An open source terminal software for MS-Windows™, that may be used for this purpose, is *UTF-8 TeraTerm Pro with TTSSH2*, downloadable at *http://sourceforge.jp/projects/ttssh2/files.*

The fixed (not operator editable) settings for the interface are

Baudrate	19200
Startbit	1
Parity	Even
Stopbit	1
MODB mode[1)]	32 Bit
ID number	1

[1)] MODB mode may be changed via related Modbus register



Pin no.	RS 232
1	*not used*
2	RXD
3	TXD
4	*not used*
5	Common
6	*not used*
7	*not used*
8	*not used*
9	*not used*

Fig. 7-18: Service Port Connector - Serial RS 232 Interface

7.7.4.2 Save CfgData to SvcPort

Open the terminal software on your external device.

```
Setup..
Save-Load..
```

Starting at the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP.. and next the SAVE-LOAD.. menu.

If system is setup accordingly, access level 3 code must be entered to gain access to this menu.

```
    Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

Now select the "CfgData>SvcPort!" line and press the ENTER key.

```
   Copying data
 - PLEASE WAIT -

Procedure       <-->
```

The instrument now copies the currently used (and possibly changed by operator) analyzer setup on an external device for future use.

```
        (i)

-COMMAND EXECUTED-
```

When the procedure has finished, the COMMAND EXECUTED screen shows up.

7.7. Save / Restore Configuration Data Sets

The SAVE-LOAD.. menu also offers an option to verify that the saved data on the external device has not been corrupted during transmission:

```
     Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

With the external device still connected select the "Verify!" line and press the ENTER key.

The analyzer now loads the data from the external device and compares it to the **CfgData**. Finally a status screen shows up, followed by a COMMAND EXECUTED screen or an error message, if the data does not match.

7.7.4.3 Restore SvcPort to CfgData

Open the terminal software on your external device.

```
Setup..
Save-Load..
```

Starting at the measurement screen press the DOWN key to open the MAIN MENU, enter the SETUP.. and next the SAVE-LOAD.. menu.

If system is setup accordingly, access level 3 code must be entered to gain access to this menu.

```
     Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

Now select the "SvcPort > CfgData.." line and press the ENTER key.

```
   SvcPort>CfgData
    Are you sure?
No!
Yes!
```

A screen appears to confirm the operation: Select **Yes!** and after pressing the ENTER key a new screen shows up showing the current status.

```
 SvcPort > CfgData
   -PLEASE WAIT-
              <-->
↵  for cancel!
```

The instrument now copies the data from the external device into the analyzer CfgData.

```
        (i)

 -COMMAND EXECUTED-
```

When the procedure has finished, the COMMAND EXECUTED screen shows up for 2 seconds, followed by….

```
     Save-Load
CfgData > SvcPort!
SvcPort > CfgData..
▼Verify!
```

… the previous menu page. After a few seconds the analyzer automatically starts to reboot.

Chapter 8
Troubleshooting

8.1 Abstract

This chapter covers troubleshooting the analyzer:

Section 8.2 describes messages possibly appearing in the measuring screen‘s status line (4th line), gives hints on the potential causes and on how to solve the problem(s).

Two tables differentiate between analyzer related messages and channel related messages.

As the analyzer software is not capable to detect all problems and faults, section 8.3 describes such faults, their consequences, gives hints on potential causes and on how to solve the problem(s).

Section 8.4 gives detailled instructions on how to replace or adjust components, addressed to personnel familiar with the aspects of working on such components.

8.2 Problems Indicated by Status Messages
Analyzer Related Messages ☞ page 8-3
Channel Related Messages ☞ page 8-6

8.3 Problems NOT Indicated by Status Messages ☞ page 8-11
8.4 Extended Troubleshooting on Components ☞ page 8-17

8.2 Solving Problems Indicated By Status Messages

As mentioned status messages are displayed inthe measuring screen‘s 4 th line. Multiple status messages active at a time show up sequentially in the status line. To see all status messages at a glance enter the STATUS menu:

```
Status..

1 Failures..
0 Check requests..
1 Function checks..
▼0 Off spec..
```

The first page shows 4 lines each beginning with a number (indicating how many messages of the related kind are active). Enter a line with a number different than "0" to see the related messages.

In the following all possible status messages are listed in an alphabetical order together with hints on the possible causes and tips on how to solve the problems.

The list also shows a level indicator: In general one can assign four different levels to causes generating status messages. Depending on the level assigned the instrument activates different relay status signals, according the NAMUR NE 107 specifications.

Supported status levels:

Failures: Requires immediate actions. The analyzer is not any longer working properly and the output signal is invalid due to malfunction.

Off-spec: The analyzer is working outside its specification (e.g. measuring range), or internal diagnoses indicate deviations due to internal problems. To achieve proper outputs, corrective action is required.

Check request (*or maintenance requests***)**: The instrument is still working properly, within its specifications and the output signal is valid, but maintenance is required in for-seeable future because a function will soon be restricted or a wear reserve is nearly exhausted.

Function check: The analyzer is still working properly but currently is in a status where the output signal is temporarily invalid (e.g. frozen) due to the ongoing work on the instrument (e.g. during calibration).

If solving a reported problem requires working inside an open instrument, take care of the safety instructions given at the beginning of this manual!

8.2.1 Analyzer Related Messages

Message *Status level* Explanation	**Description**	**Actions**
FlowAlm *Check request* Explanation: The internal flow control detected a flow problem	The detected flow is too low or missing due to a leak, not limited to the instrument's internal gas path	Check the external and internal gas path for leakage and plugging
		If applicable check internal pump function
LocalAccess *Function check* Explanation: This status message is activated when a parameter is changed using the front panel keys	Someone has changed a parameter by using the front panel keys	Press the HOME key: The status message is reset when returning to the measurement screen
		Acknowledge the message via menu CONTROL.. - ACKNOWLEDGEMENTS.. ***Note!*** *This resets ALL status messages!*
NotSampleGas *Function check* Explanation: The gas currently flowing is not the expected sample gas	Other than sample valve is opened within installed valve block	Switch on sample valve
	Installed pump is switched off	Switch on the pump
	Instrument is currently in calibration mode	Wait for calibration to end
	After calibration the sample gas valve has opened, but the post-purge time has not yet elapsed	Wait for purge time to elapse. If appropriate reduce purge time
Pressure *Out of spec* Explanation: The internal pressure control detected a pressure problem	The detected pressure is too low or missing due to a leak inside or outside the instrument	Check the external and internal gas path for leakage and plugging
		If applicable check internal pump function

8.2.1 Analyzer related messages

<table>
<tr><th>Message
Status level
Explanation</th><th>Description</th><th>Actions</th></tr>
<tr><td>NVRAM fail
Check request

Explanation:
NVRAM test failed</td><td>Installed NVRAM and/or electronics board defective</td><td>Replace</td></tr>
<tr><td>ROMmemory
Failure

Explanation:
Wrong code checksum</td><td>Installed FLASH memory defective</td><td>Replace board</td></tr>
<tr><td rowspan="2">Simulation
Function check

Explanation:
This message does not appear during operation modes!</td><td rowspan="2">The instrument is set into a debugging mode by service personnel</td><td>Switch analyzer off and on again to exit the debugging mode</td></tr>
<tr><td>Switch off the related simulation parameters (in service level or by Modbus command)</td></tr>
<tr><td rowspan="3">Warm-up
Function check

Explanation:
This message may require temperature monitoring enabled within the service level</td><td>The warm-up time has not yet elapsed after last analyzer restart</td><td>Wait for warm-up time to elapse</td></tr>
<tr><td rowspan="2">Temperature of analyzer components or physical thermostatted compartment is not within the configured range</td><td>Wait for instrument to heat up</td></tr>
<tr><td>check internal heater for proper function</td></tr>
<tr><td rowspan="2">SensTimeout
Failure

Explanation:
No internal communication to XSP board</td><td rowspan="2"></td><td>Check internal wiring</td></tr>
<tr><td>Check COM parameters via SVC port</td></tr>
<tr><td>SensCmdFail
Failure

Explanation:
Sending a command to XSP board failed</td><td>Bandwidth, currently available for data exchange with XSP board, too small</td><td>Acknowledge the message. If recurring, call for service.</td></tr>
</table>

8.2.1 Analyzer related messages

Message *Status level* Explanation	**Description**	**Actions**
Calibration *Function check* Explanation: Calibration active	Currently a calibration procedure is ongoing	Wait for calibration to finish
		Cancel calibration
SvcPort > Cf *Function check* Explanation: SVC port in use	Instrument is currently configured via service interface	Wait for data transfer to finish
	SVC port is in pass through mode	Switch back to normal communication mode
Unlinear *Off-spec* Explanation: This message does not appear during operation modes!	Instrument has been set to "unlinear mode" by service personnel (see "simulation")	Switch off diagnostic mode (Modbus command)

8.2.2 Channel Related Messages (Preceded By Channel Tag, E.g. CO2.1)

Message *Status level* **Explanation**	**Description**	**Actions**
ADC-Error *Failure* Explanation: A/D conversion overflow	The A/D converter of the related channel is not working properly	Switch analyzer OFF and ON again
		Call for service
RangeOverflo *Off-spec* Explanation: Gas concentration is out of range	Gas concentration is out of measurement range and therefore linearization curve does not apply	Adjust gas concentration to be within range
Simulation *Function check* Explanation: This message does not appear during operation modes!	The instrument is set into a debugging mode by service personnel	Switch analyzer off and on again to exit the debugging mode
		Switch off the related simulation parameters (in service level menu)
Temperature *Out of spec* Explanation: Temperature out of specified range	Warm-up not yet finished	Wait until warm-up has finished (10 - 50 min, depending on system)
	Temperature controler defective	Call service center
Chopper *Failure* Explanation: Chopper is not working properly	Either speed control or chopper itself is defective	Replace defective component
Detector *Failure* Explanation: Preamp is not working properly	Either output signal too small or distorted, or preamp is defective	Check output signal or replace component

8.2.2 Channel Related Messages

Message *Status level* **Explanation**	**Description**	**Actions**
Source *Failure* Explanation: IR found defective	Normally this message is initiated by a missing power supply. ⚠ **CAUTION! Hot components!** Check source (cold housing means defective).	Replace source
SCalTolChk *Check request* Explanation: Enabled tolerance check detected while spanning (measured value differing more than 10 % from setpoint)	Wrong setpoint value	Check span gas setpoint
	Wrong span gas applied	Check span gas
	IR/UV channel: Photometric components polluted	Check and if need be clean photometric components
	Instrument not yet calibrated (first calibration after installation)	Disable tolerance check before restarting the calibration
ZCalTolChk *Check request* Explanation: Enabled tolerance check detected while zeroing (measured value differing more than 10 % from setpoint)	Wrong setpoint value	Check zero gas setpoint
	Wrong zero gas applied	Check zero gas
	IR/UV channel: Photometric components polluted	Check and if need be clean photometric components
	Instrument not yet calibrated (first calibration after installation)	Disable tolerance check before restarting the calibration
ZCalRefused *Check request* Explanation: This message does not appear during normal operation modes!	Wrong DSP (sensor) configuration	Call for service

8.2.2 Channel Related Messages

Message *Status level* **Explanation**	**Description**	**Actions**
SCalRefused *Check request* Explanation: This message does not appear during normal operation modes!	Wrong DSP (sensor) configu-ration	Call for service
FlowLimAlm *Check request* Explanation: Flow too low	Flow sensor detected flow to be below set limit	Increase flow Set new limit
TempRange *Off-spec* Explanation: Only at instruments with thermostate control	Temperature during operation out of range	Check heater elements
TempSensor *Off-spec* Explanation: Temperatur sensor defective	Instruments µP detected tem-perature sensor to be defec-tive	Check temperature sensor
Alarm Level1 - - Explanation: Concentration alarm level 1 is activated (exceeded)	Alarm level 1 was exceeded	Adjust the gas concentration to be within the set limits
Alarm Level2 - - Explanation: Concentration alarm level 2 is activated (exceeded)	Alarm level 2 was exceeded	Adjust the gas concentration to be within the set limits

8.2.2 Channel Related Messages

Message *Status level* **<u>Explanation</u>**	**Description**	**Actions**
Spanning *Function check* <u>Explanation:</u> Ongoing span calibration ***Note!*** *In the status menu this message shows up in the "Calibration" line without channel tag!*	Span calibration ongoing for the channel identified by the tag	Wait until calibration has finished Cancel calibration
Zeroing *Function check* <u>Explanation:</u> Ongoing zero calibration ***Note!*** *In the status menu this message shows up in the "Calibration" line without channel tag!*	Zero calibration ongoing for the channel identified by the tag	Wait until calibration has finished Cancel calibration

8.2.2 Channel Related Messages

8.3 Solving Problems Not Indicated By Status Messages

The following table lists possible faults not detectable by the instrument‘s software, gives hints on the potential causes and tips on how to solve the problems.

If solving a problem requires working inside the instrument take care of the safety instructions given at the beginning of this manual!

Note on X-STREAM Fieldhousings!

To see the current status even when the front door is open, the front panel may be swivelled to the side (XLF; XXF) or downwards (X2FD).

To do so loosen the four nuts fixing the front panel to the door and swivel the front panel using the remaining srews as hinges.

8.3 Solving Problems Not Indicated by Status Messages

Situation	Description	Actions
Display dark	Power supply missing	Check power connection
		Check power supply
		Check instrument‘s power fuses
		Check power supply unit: green LED (OK)
	Front panel connection faulty	Check front panel connections
Instrument does not work nor respond on inputs	CPU hang up	Disconnect power to reset CPU
No analog output signal	External failure	Check external circuitry for failures
	Internal connection failure	Check signal connection at P22 of board XPSA
		XPSA: If red LED "No PWM" glows - check connection to P19
		XPSA: LED "No PWM" dark - check power connection to XPSA (2-pole cable br/wht)
	Analog outputs 2 - 4 affected	check installation of module XSIA on XPSA board
Digital outputs not working properly	External failure	Check external circuitry for failures
	Configuration failure	Check digital outputs menu settings
	Outputs 1 - 4 affected	XPSA: If red LED "TIMEOUT" glows - check connection to P33
		XPSA: LED "TIMEOUT" dark - check power connection to XPSA (2-pole cable br/wht)

8.3 Solving Problems Not Indicated by Status Messages

Situation	Description	Actions
Digital outputs not working properly (cont.)	Outputs on extension board(s) (XDIO) affected	XDIO: If LED "TIMEOUT" glows - check jumpers on XDIO. XDIO #1: jumper on ADR2 XDIO #2: jumpers on ADR2 & ADR0
		XDIO: If LED "TIMEOUT" glows - check connection to P33
		XDIO: If LED "NO SPI" glows - check internal SPI communication cable (10 pole cable)
Digital inputs not working properly	External failure	Check external circuitry for failures
	Configuration failure	Check digital inputs menu settings
	Outputs on extension board(s) (XDIO) affected	XDIO: If LED "TIMEOUT" glows - check jumpers on XDIO. XDIO #1: jumper on ADR2 XDIO #2: jumpers on ADR2 & ADR0
		XDIO: If LED "TIMEOUT" glows - check connection to P33
		XDIO: If LED "NO SPI" glows - check internal SPI communication cable (10 pole cable)
Internal valves not working properly	Connection failure	Check electrical connection of valves
		XPSA: If red LED "TIMEOUT" glows - check connection to P33
		XPSA: LED "TIMEOUT" dark - check power connection to XPSA (2-pole cable br/wht)
External valves not working properly	Valves connected to digital outputs	See "Digital outputs not working properly"
	Valves not connected to digital outputs	Check external valve controller

8.3 Solving Problems Not Indicated by Status Messages

Situation	Description	Actions
Serial communication not working properly	External failure	Check external circuitry for failures
	Connection failure	XPSA: If red LED "TIMEOUT" glows - check connection to P33
		Check installation of interface module (SIF xxx)
Fluctuating or invalid readout	Leak in gas path	Perform a leak test
	Ambient air contains high concentration of measured gas component	Check absorber (at chopper/ measuring cell) and replace if need be.
		Replace photometer with sealed version (option) Purge instrument with neutral gas
	Fluctuating gas pressure	Check gas path before and behind cell and sensor
		Remove restriction behind gas outlet
		Reduce gas flow or pump rate
	Sensor or detector not connected	Check detectors connections
	Electrochemical Oxygen sensor worn-out	Check sensor and replace if need be
	IR channel: Source not connected or defective	Check connections: X3 (1/2) / source channel 1 X3 (4/5) / source channel 2 If source housing is cold: Exchange both source in case of dual channel analyzer / replace source if need be (see service manual)
	Analog preamplifier of affected channel defective	Check measuring point (☞ 8-4-2-1-6, page 8-19)

8.3 Solving Problems Not Indicated by Status Messages

Situation	Description	Actions
Fluctuating or invalid readout (continued)	Gas path(s) polluted	Check analysis cells and windows for pollution
		Clean polluted parts (see service manual)
		Check gas paths for pollution and clean gas paths if need be
	Wrong pressure value used for compensation	Set ambient pressure to proper value (☞ 6.2.3.3, page 6-28)
		Sensor failure (☞ status message "PressSensor“, page 8-4)
	Condensation inside gas path	Check temperature of gas path(s)
		Remove all sources of condensation
		Keep all temperatures at least 10 °C above sample gas temperature
Readout damping time too long	Wrong signal damping settings	Check signal damping (☞ 6.2.3.3.1, page 6-29)
	Pump rate too low	Distance between sampling point and analyzer too long
		Replace pump by external model with higher pump rate (operate in bypass mode, ☞ fig. 4-2, page 4-4)
	Gas path(s) polluted	Check gas path and sample handling system for pollution Clean gas path

8.3 Solving Problems Not Indicated by Status Messages

Situation	Description	Actions
No gas flow	Sample gas pump (option) switched off	Switch on sample gas pump (☞ 6.2.2, page 6-5)
	Membrane of sample gas pump defective	Replace sample pump mem- brane
	Sample gas pump defective	Replace sample gas pump
	Solenoid valves (option) not opened / defective	External valves: Check connection between valves and digital outputs Check valve seat and replace if need be Replace solenoid valves For valve control via serial interface or digital inputs: Any valve activated?
	Gas path(s) polluted	Check gas path and sample handling system for pollution Clean gas path

8.4 Troubleshooting On Components

This section give information on how to check and replace internal components.

Some work described on the next pages need to be carried out by qualified personnel only, and may require special tools, to ensure the instrument or component is not damaged or disadjusted!

8.4.1	Opening X-STREAM Analyzers	☞ page 8-19
8.4.2	Measuring Points	☞ page 8-21
8.4.3	Sample Pump: Replacement of Diaphragm	☞ page 8-22
8.4.4	Paramagnetic Oxygen Cell: Adjustment of Physical Zero	☞ page 8-33
8.4.5	Thermal Conductivity Cell: Adjustment of Output Signal	☞ page 8-36

WARNING

ELECTRICAL SHOCK HAZARD

Working at opened and powered instruments means working near live parts and is subject to instructed and trained personnel only!

Take care to observe all applicable safety instructions!

8.4 Troubleshooting on Components

WARNING

HAZARD FROM EXPLOSIVE, FLAMMABLE AND HARMFUL GASES

Before opening gas paths they must be purged with ambient air or neutral gas (N_2) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

CAUTION

HIGH TEMPERATURES

While working at internal components hot surfaces may be accessible, even after the instrument has been disconnected from power!

CAUTION

ELECTROSTATIC DISCHARGE HAZARD

Working at internal components of electronical and electrical instruments may cause electrostatic discharge (ESD), destroying components!

Working at open instruments is recommended at special workplaces only! If no such workplace is available, at minimum perform the following procedures to not destroy electronic components:

Discharge the electric charge from your body. Do this by touching a device that is grounded electrically (e.g. instruments with earth connectors, heating installations). This should be done periodically when working at open instruments (especially after leaving the service site, because e.g. walking on low conducting floors might cause additional ESD).

8.4 Troubleshooting on Components

8.4.1 Opening X-STREAM Analyzers

8.4.1.1 How To Open X-STREAM X2GP

Remove the top cover after loosening the 12 screws.

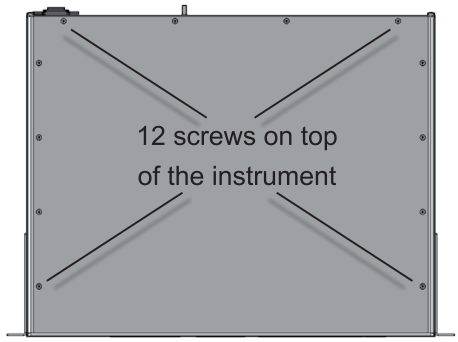


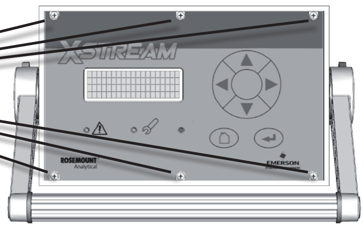
Fig. 8-1: X-STREAM X2GP

8.4.1.2 How To Open X-STREAM X2GK

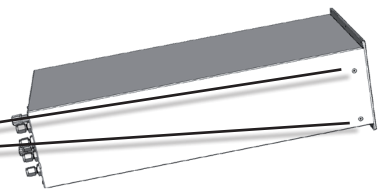
If your instrument is equipped with a handle

- loosen the 6 screws at the front panel,
- to only get access to the cover screws, push frame and handle about 2 cm / 1" towards the rear.

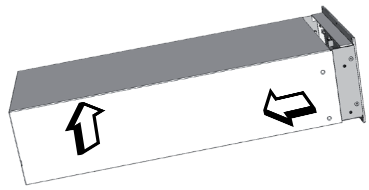
Note!
To completely remove frame and handle, you need to disconnect all gas and electrical connections and push frame and handle over the rear panel.



- remove the 4 screws for the cover, (2 screws on each side of the instrument



- push the cover towards the rear and remove it.



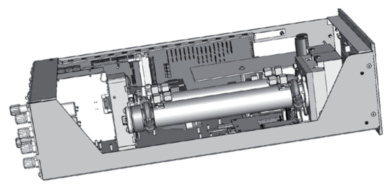


Fig. 8-2: X-STREAM X2GK

8.4 Troubleshooting on Components

8.4.1.3 How To Open X-STREAM Field-housings

Depending on the individual analyzer configuration, either open the upper or lower front door to the left, utilizing the two sash fasteners.

8.4.1.4 How To Open X-STREAM X2FD

To open a X-STREAM X2FD loosen the 20 screws located at the instrument´s flange. Then carefully flip down the front door to not damage the instrument, hinges or equipment installed below the analyzer.

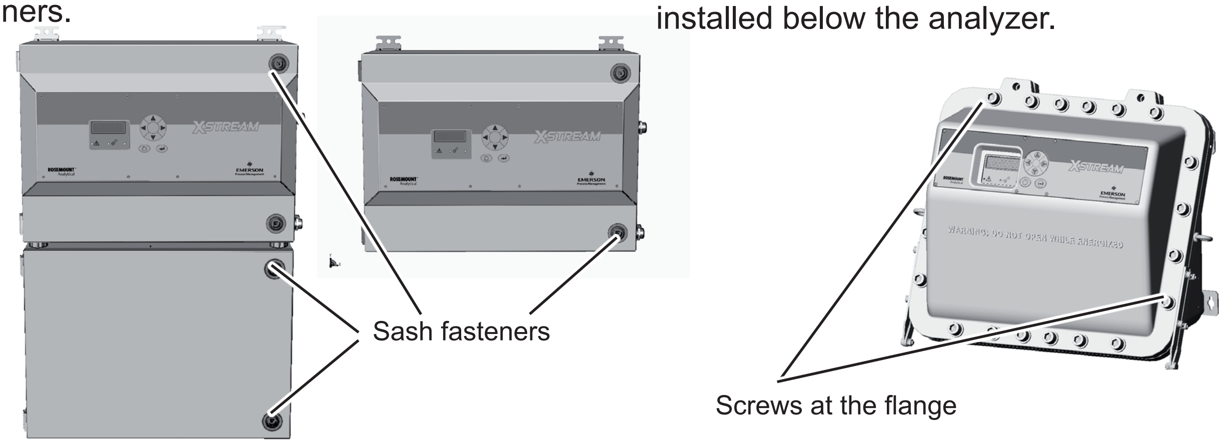


Fig. 8-3: X-STREAM X2 Field housings and X2FD - How to Open

WARNING

EXPLOSION HAZARD

X-STREAM X2FD as well as special variations of X-STREAM XLF and XXF Fieldhousings are intended to be installed in hazardous areas.

Maintaining such instruments is permitted only considering special conditions, givenin the associated separate manuals.

Do not open nor maintain instruments in hazardous areas without having read and understood all related instruction manuals!

CAUTION

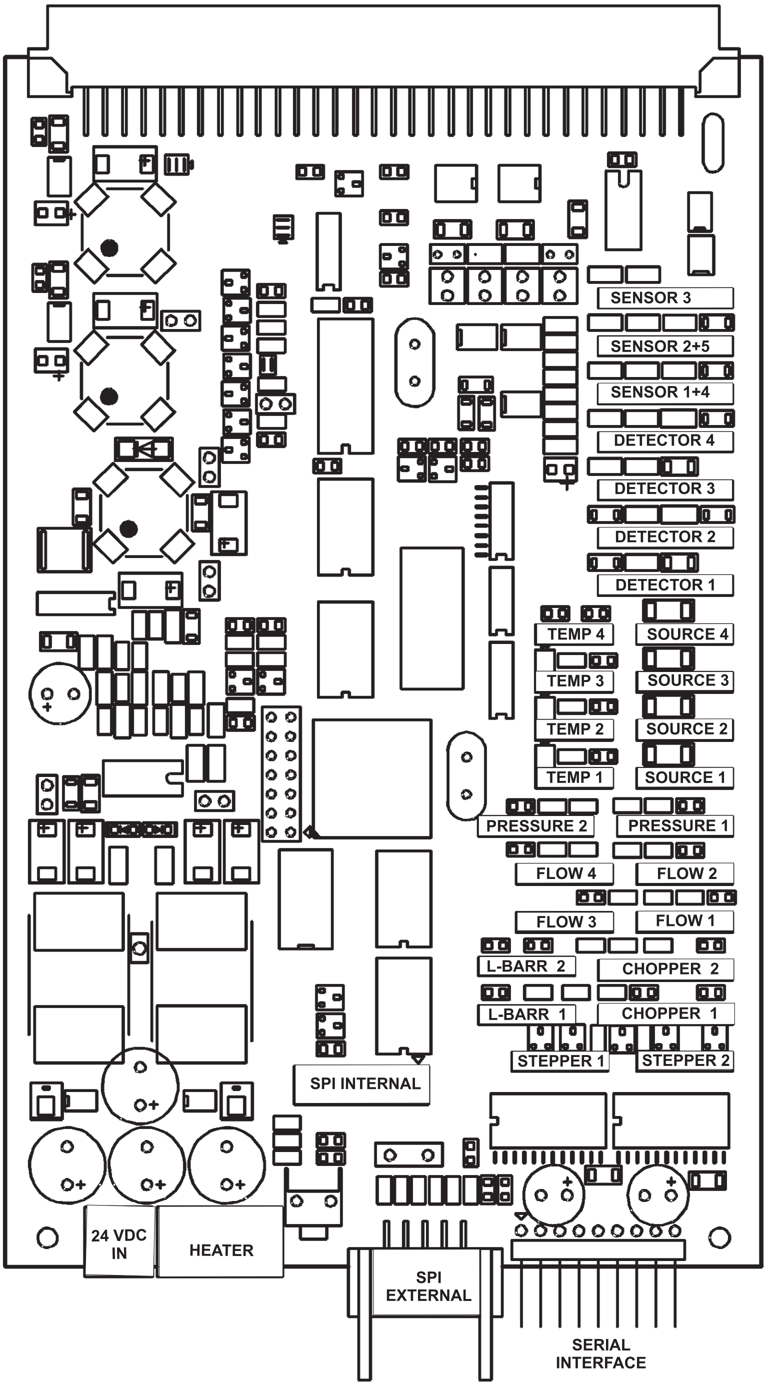
GASKETS AT LOW TEMPERATURES

Consider that enclosure gaskets may be frozen if the instrument is installed outdoors. Carefully open the enclosure at temperatures below -10 °C to not damage the gaskets.

Damaged gaskets void the ingress protection, possibly causing property damage, personal injury or death.

8.4 Troubleshooting on Components

8.4.2 Signal Connectors On XSP Board



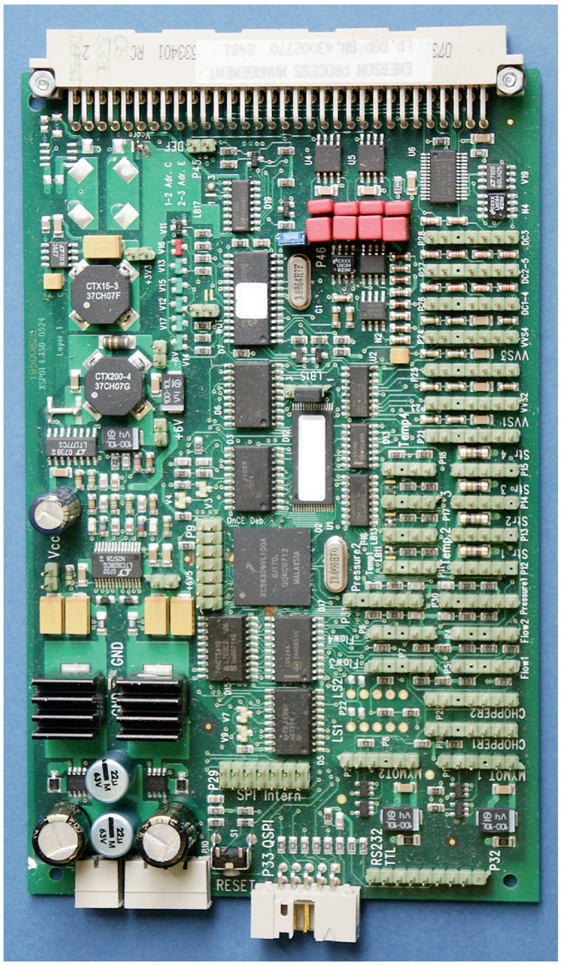
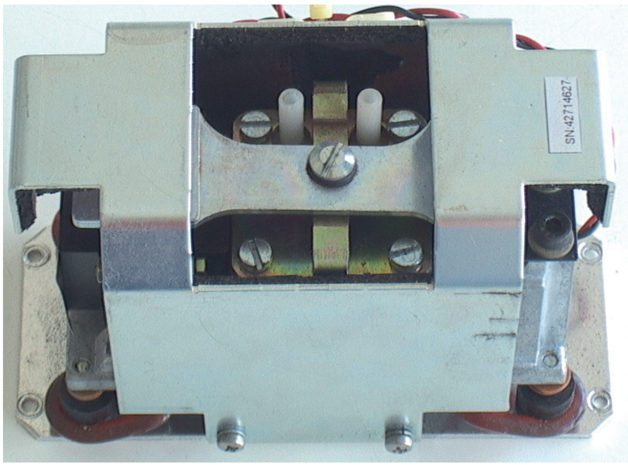


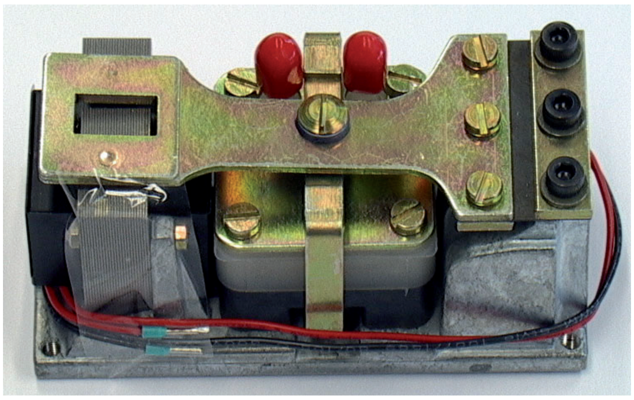
Fig. 8-4: XSP - Allocation of signal connectors

8.4.3 Sample Pump: Replacement Of Diaphragm

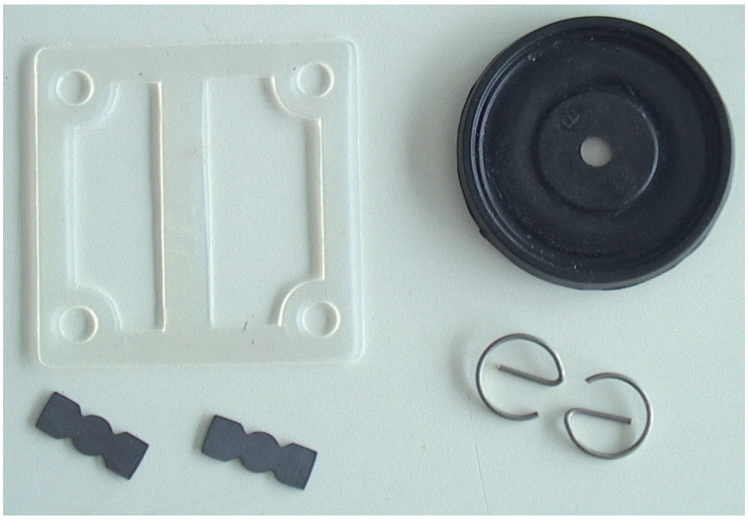


This instruction explains the procedure to replace the diaphragms of sample gas pumps (PN 42716569) used in the X-STREAM series gas analyzers.

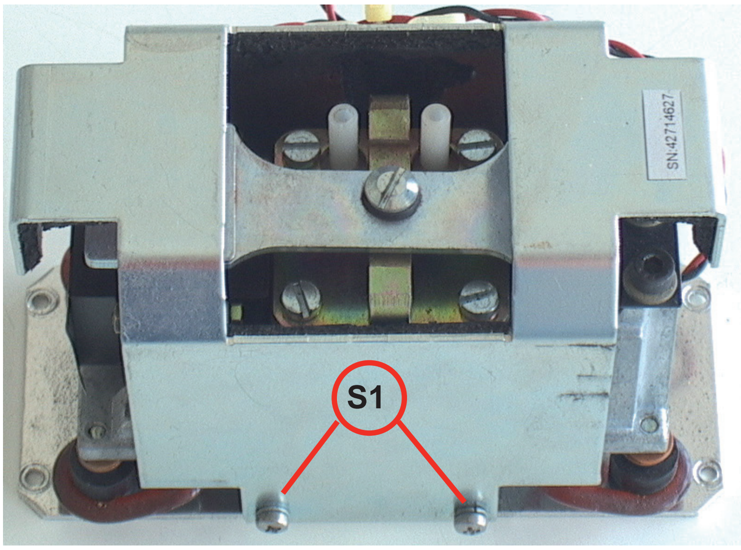
To do so you need to dismantle the pump from your analyzer.



8.4 Troubleshooting on Components

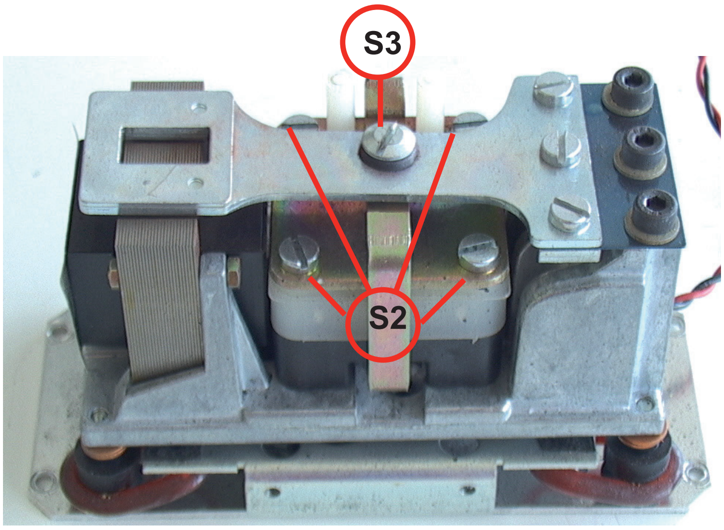


Required parts for the spare parts kit for the pump (PN 0375946).



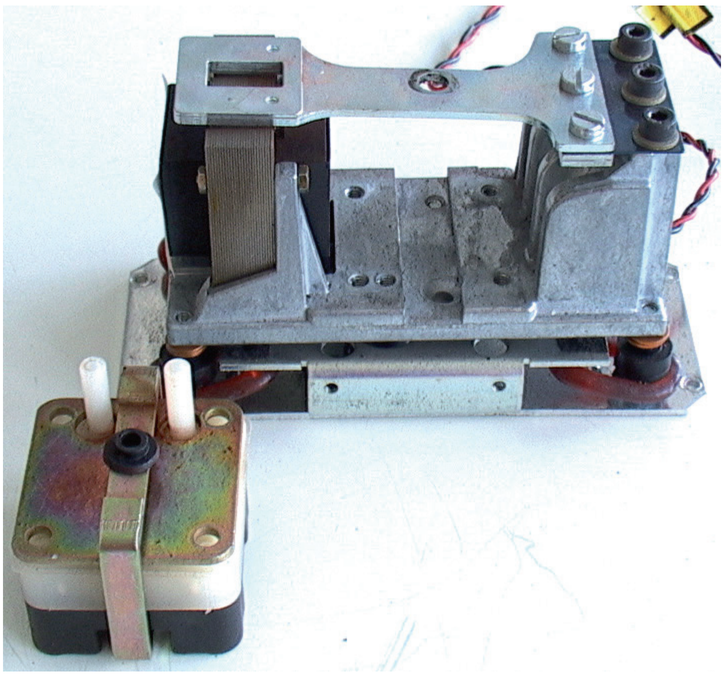
Step 1:

If applicable:
Remove the screws **S1** on both sides of the pump. Take off the cover.



Step 2:

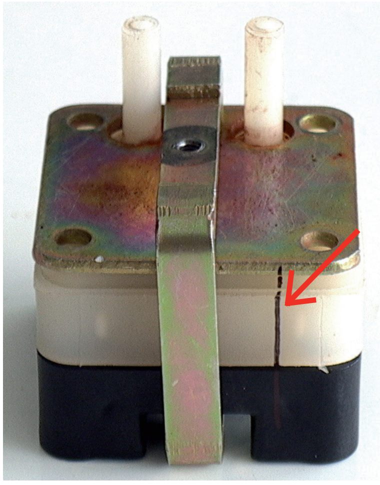
Remove the screws **S2** and screw **S3**.



Step 3:

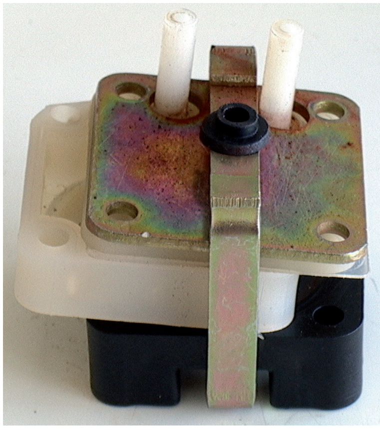
Take out the pump assy.

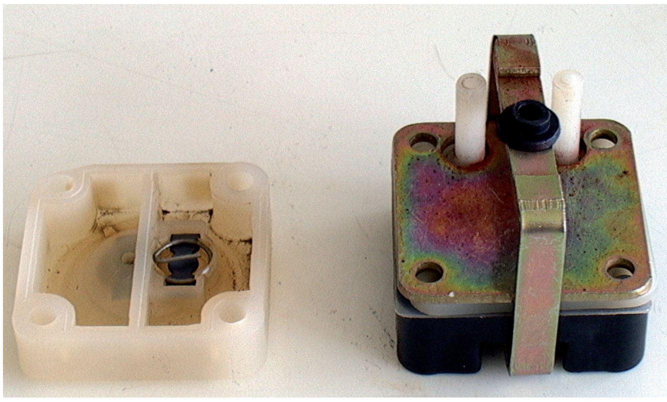
8.4 Troubleshooting on Components



Step 4:

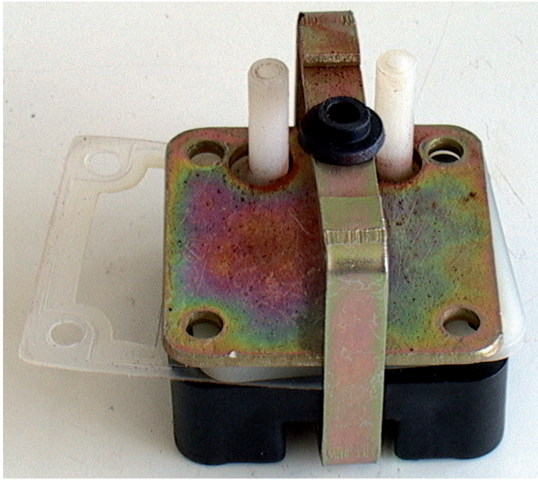
Mark the pump assy. before disassembly.





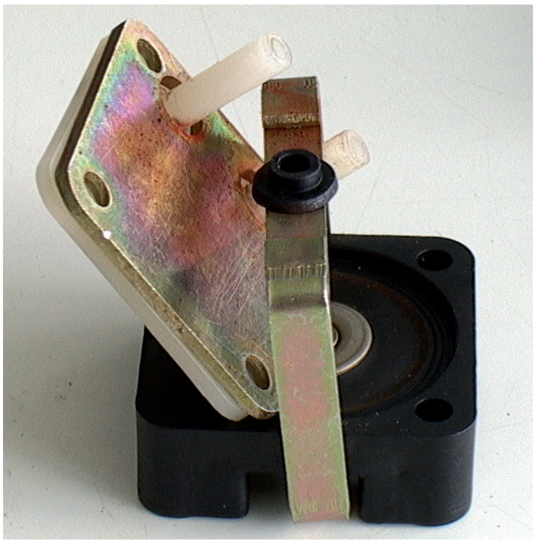
Step 5:

Remove the white block.



Step 6:

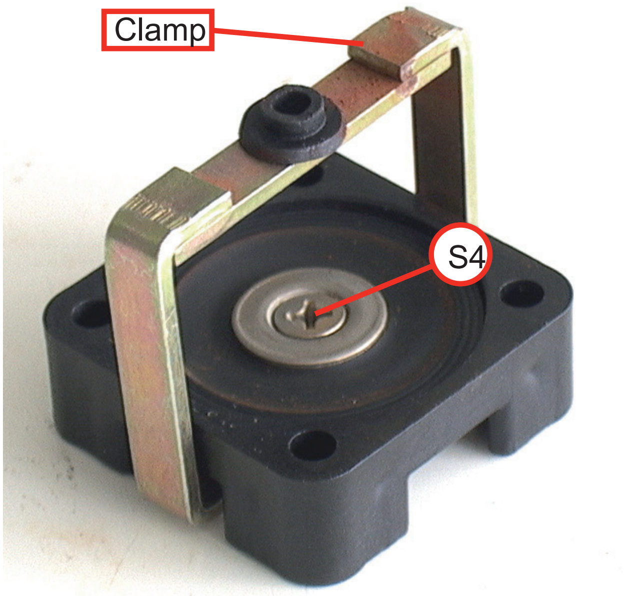
Remove the teflon gasket.



Step 7:

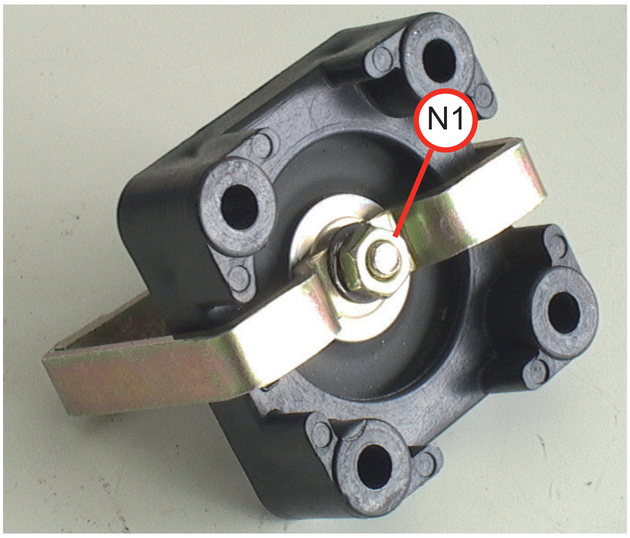
Remove the remaining two pump parts.
Clean the white plate for the gas in- and outlet.

8.4 Troubleshooting on Components

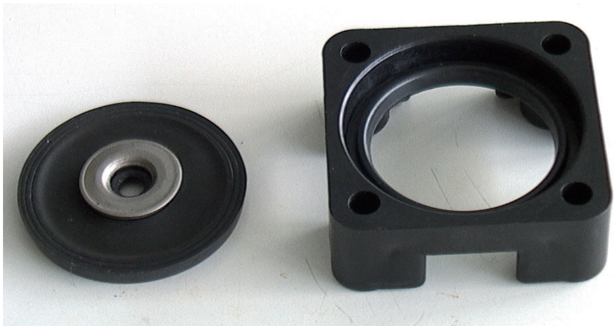


Step 8:

Disassemble the lower block and the clamp.
Loosen the screw **S4** and the nut **N1**.



8.4 Troubleshooting on Components



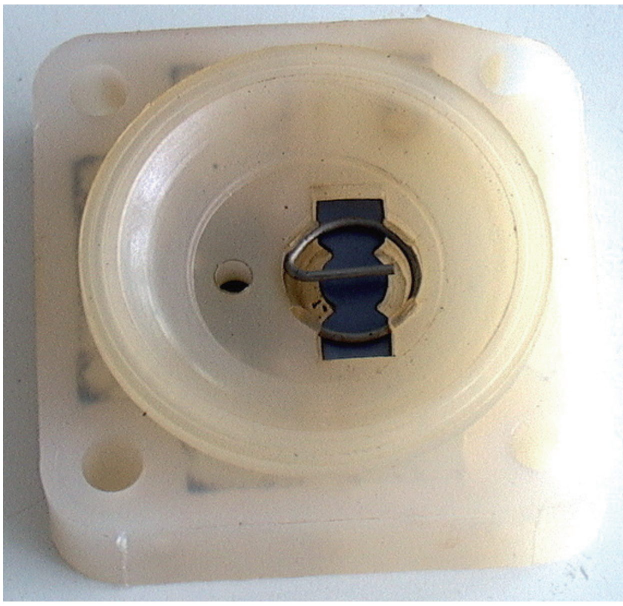
Step 9:

Remove the two washers on the diaphragm.

Step 10:

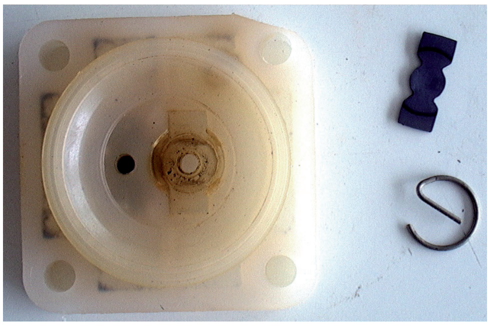
Replace the old with the new diaphragm and assemble the washers and the clamp in reverse order (step 9 and 8).

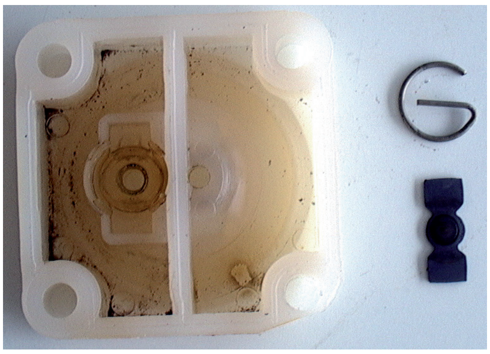
8.4 Troubleshooting on Components



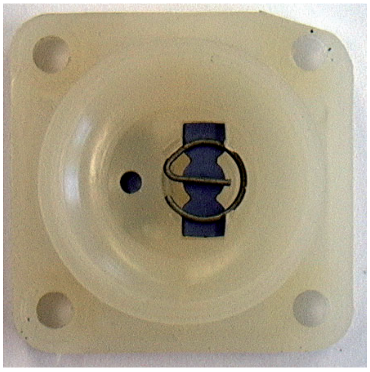
Step 11:

Remove the locking springs on both sides of the white block and take out the old diaphragms on both sides.





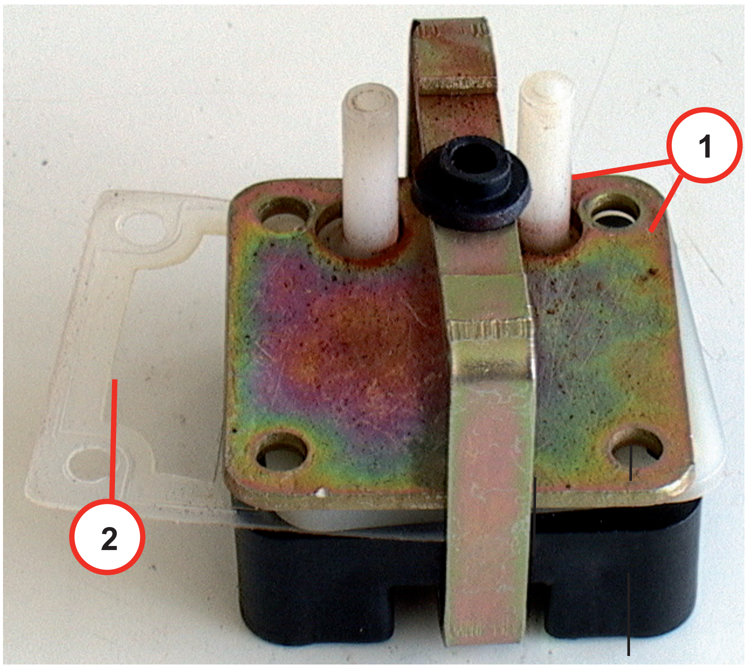
8.4 Troubleshooting on Components



Step 12:

Clean the white block.

Afterwards put in the new diaphragms and fix them with the new locking springs.

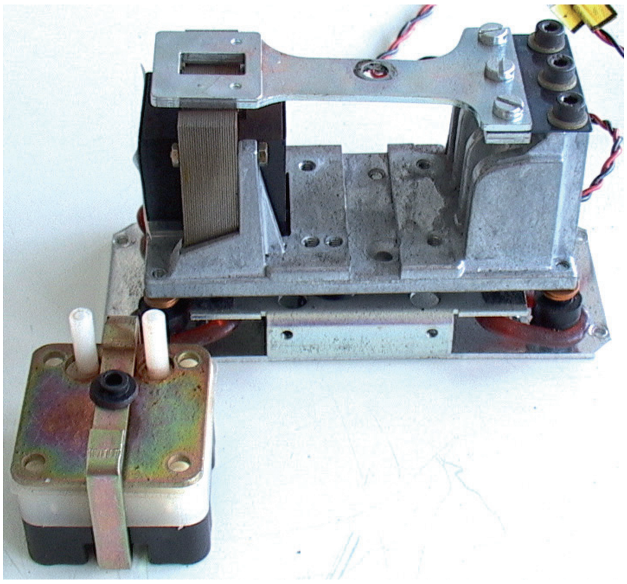


Step 13:

Assemble the pump assy. Take care of your marker (step 4)

1. Put the two upper plates under the clamp (steps 6 & 7 for reference).

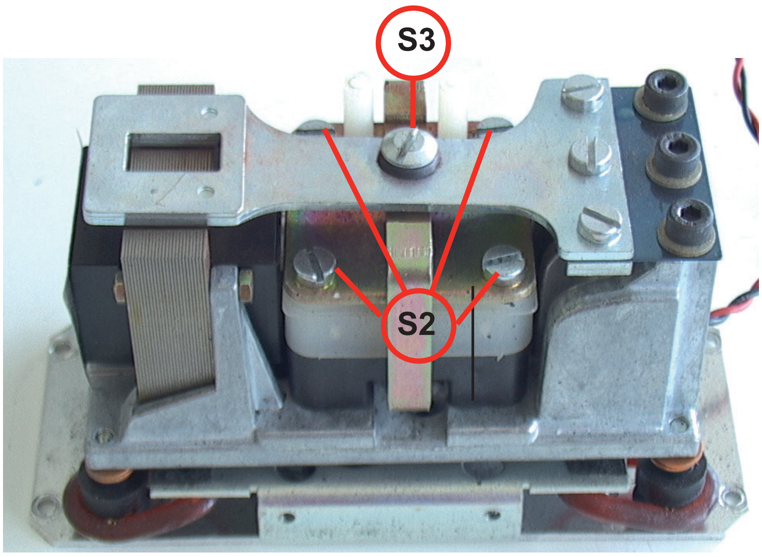
2. Put the white block and the **new** teflon gasket between the lower block and the in-outlet plate.

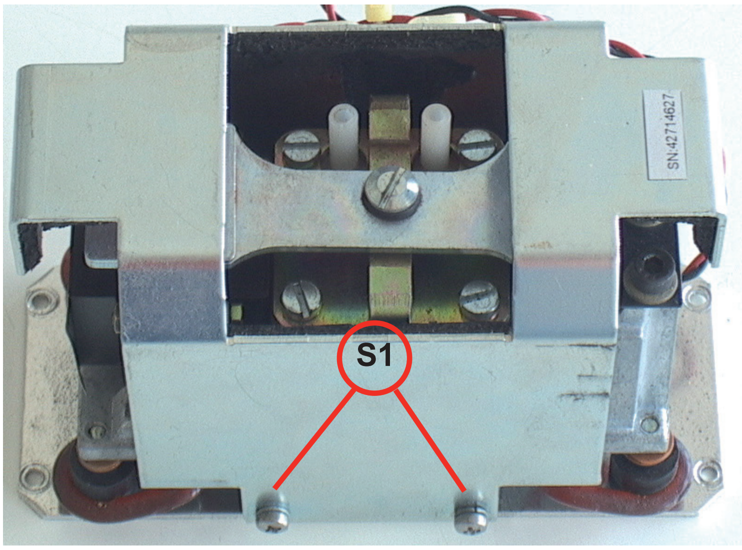


Step 14:

Assemble the pump assy in re-verse order.

Put it in the pump housing and fix it with the screws **S2**.
Fix the clamp with screw **S3** and the black buffer.



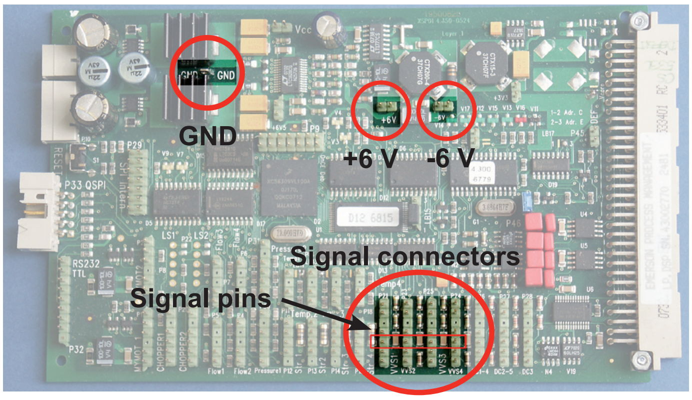


Step 15:

If applicable:
Install the cover and fix it with screws **S1** at both sides.

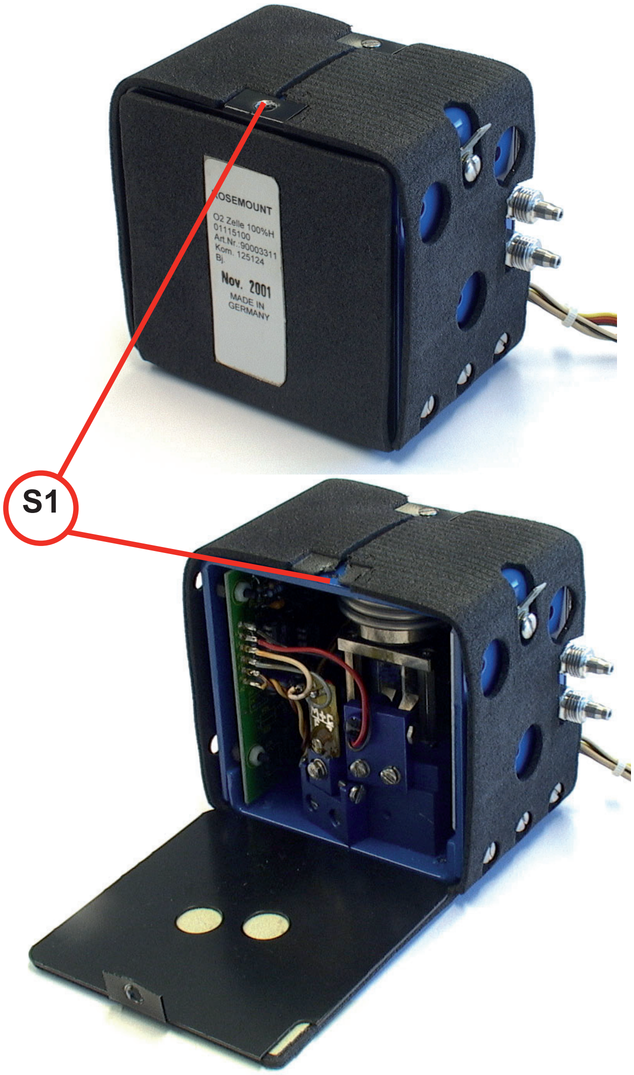
Finally re-install the pump into your analyzer, to complete the replace-ment of pump diaphragm.

8.4.4 Paramagnetic Oxygen Cell: Adjustment Of Physical Zero



To adjust the physical zero you need to measure some voltages on the XSP board: Depending on which channel the cell is assigned to, the measuring signal (+) can be measured at pin 3 of the related connector. GND (-) is available at a separate pin (see figure).

The measured voltage should be
0 V ± 50 mV.



The cell contains strong magnets!

Use only non-magnetic tools to adjust the zero point!

Step 1:

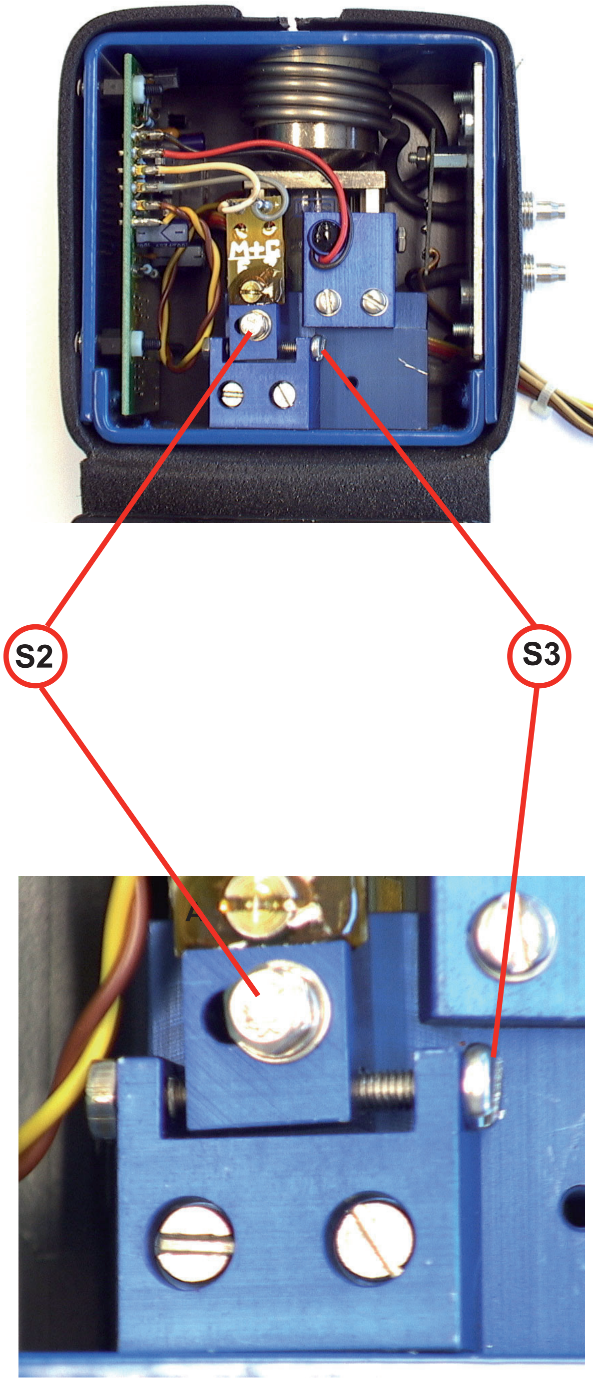
The adjoining figure shows a heated paramagnetic oxygen cell.

Note!
Depending on your specific instrument alternatively an unheated cell may be installed.
In this case skip step 2 and continue with step 3.

Step 2:

Open the cell cover by loosening the screw **S1** at the top.

8.4 Troubleshooting on Components



Step 3:

Apply N2 to the analyzer.

Step 4:

Carefully loosen the screw **S2**.
Now you can adjust the physical zero point with screw **S3**.
Turn the screw carefully.

The cell´s electronic is light sensitive: When exposed to light while adjusting the zero point utilizing screw S3, a zero point shift may arise after the cover is closed.

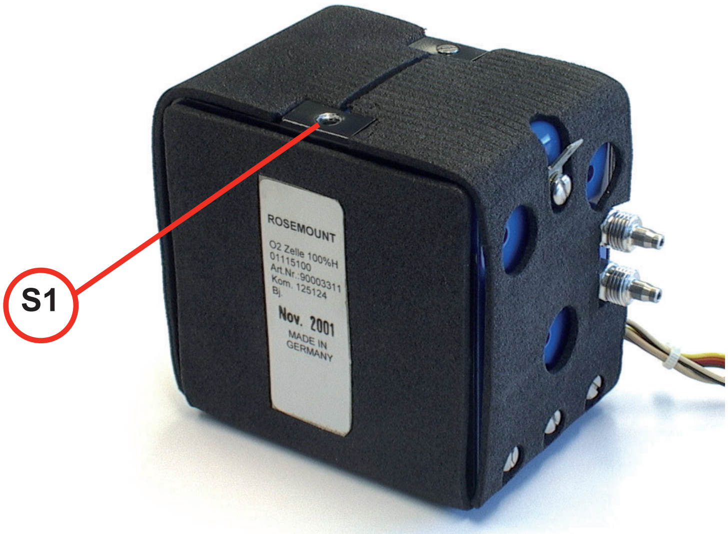
Tip:
Shade the cell with a cloth when adjusting screw S3.

Step 5:

Tighten the screw **S2** with care, close the cover and check the zero point again.

Note!
If the cell itself does not provide a cover, close the instrument while checking the cell!

You might have to re-adjust the zero point several times until it remains at the expected value.



Step 6:

Fix the closed cell´s cover with screw **S1**.

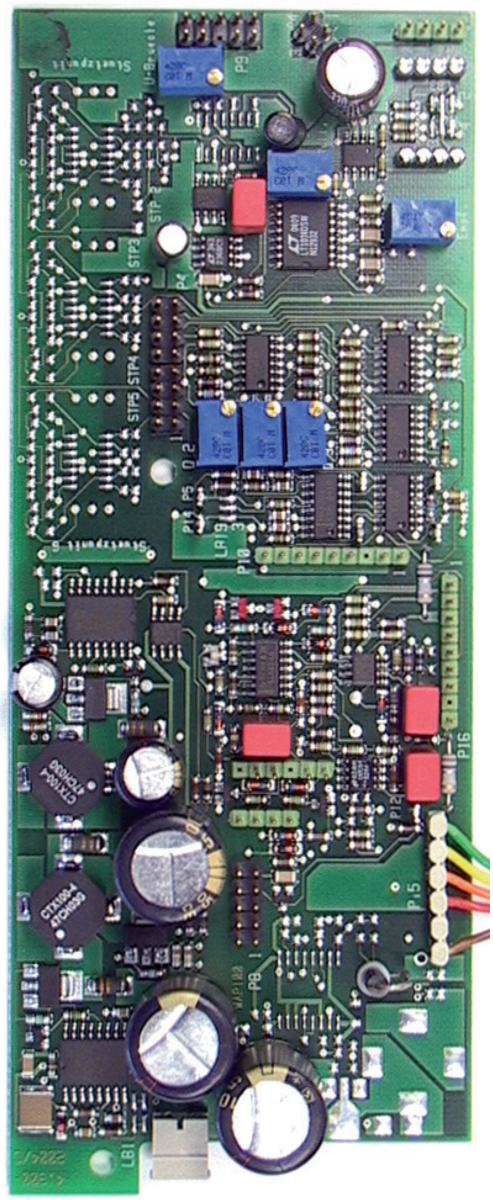
This completes the zero point adjustment procedure.

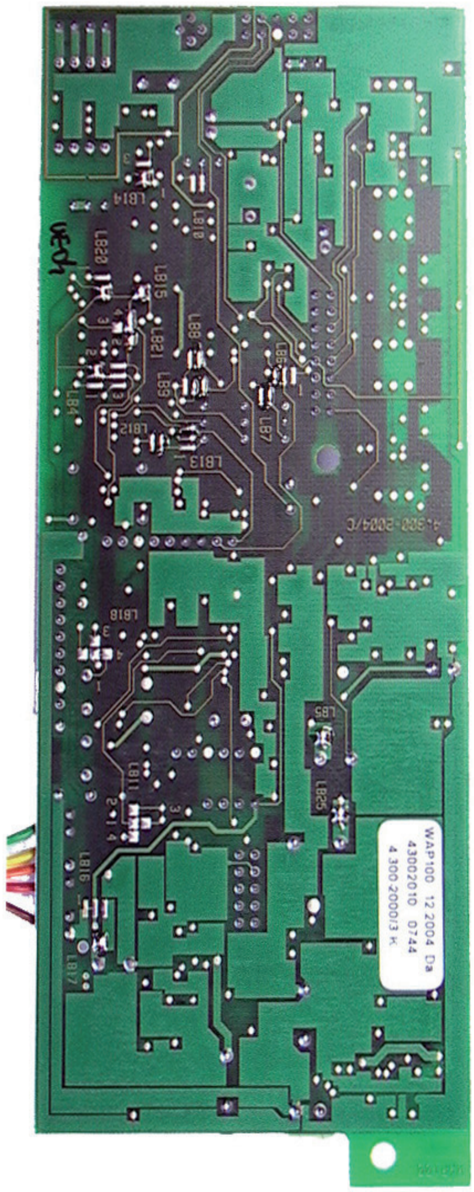
8.4 Troubleshooting on Components

8.4.5 Thermal Conductivity Cell: Adjustment Of Output Signal

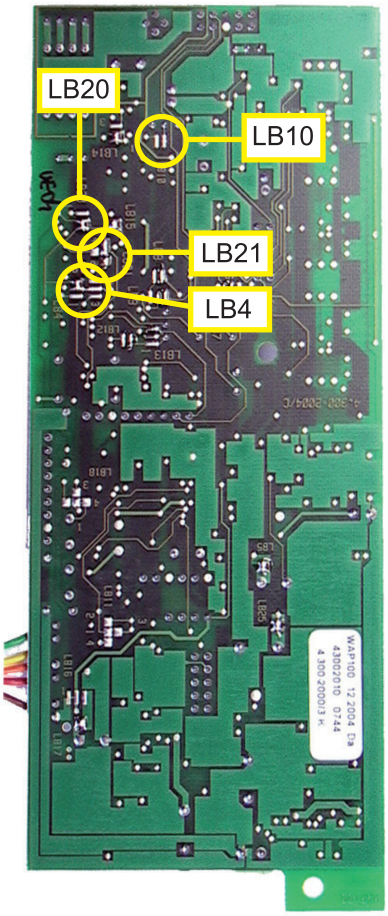
To adjust the zero signal of this measuring cell you need to have access to both sides of the related electronics board WAP 100.

A digital voltmeter (DVM) is required to measure and adjust several voltages!





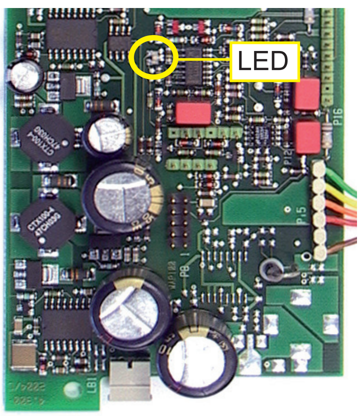
8.4 Troubleshooting on Components



Step 1:

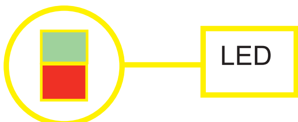
Check the solder bridges, located at the solder side of the board, for proper configuration:

LB10	open
LB4 2-5	closed
LB21 1-4	closed
LB20	open

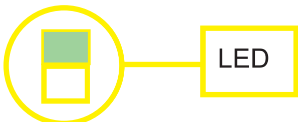


Step 2:

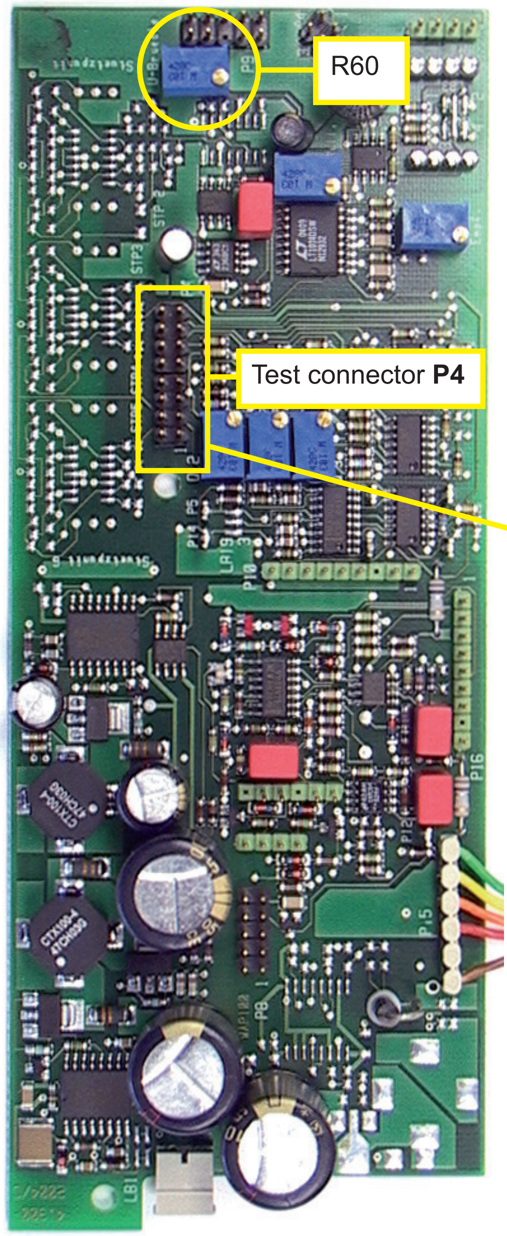
Switch on the analyzer.
The onboard LED will light up red and green.



When the warmup time has elapsed, the LED flashes green.



8.4 Troubleshooting on Components

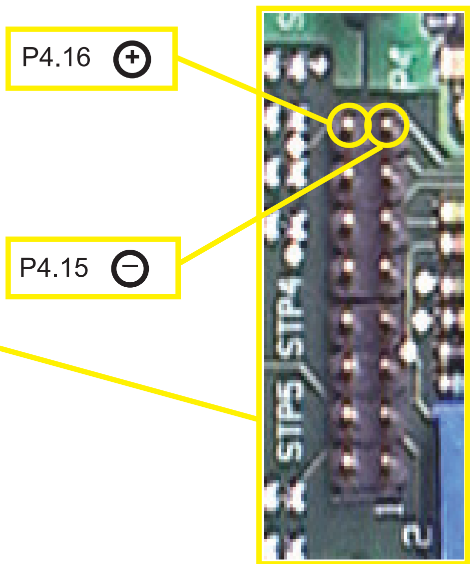


Step 3:

Locate test connector P4 to **measure the bridge voltage**:

P4.16 Bridge voltage (+)
P4.15 Bridge voltage (-); GND

CAUTION!
Do not short-circuit pins!

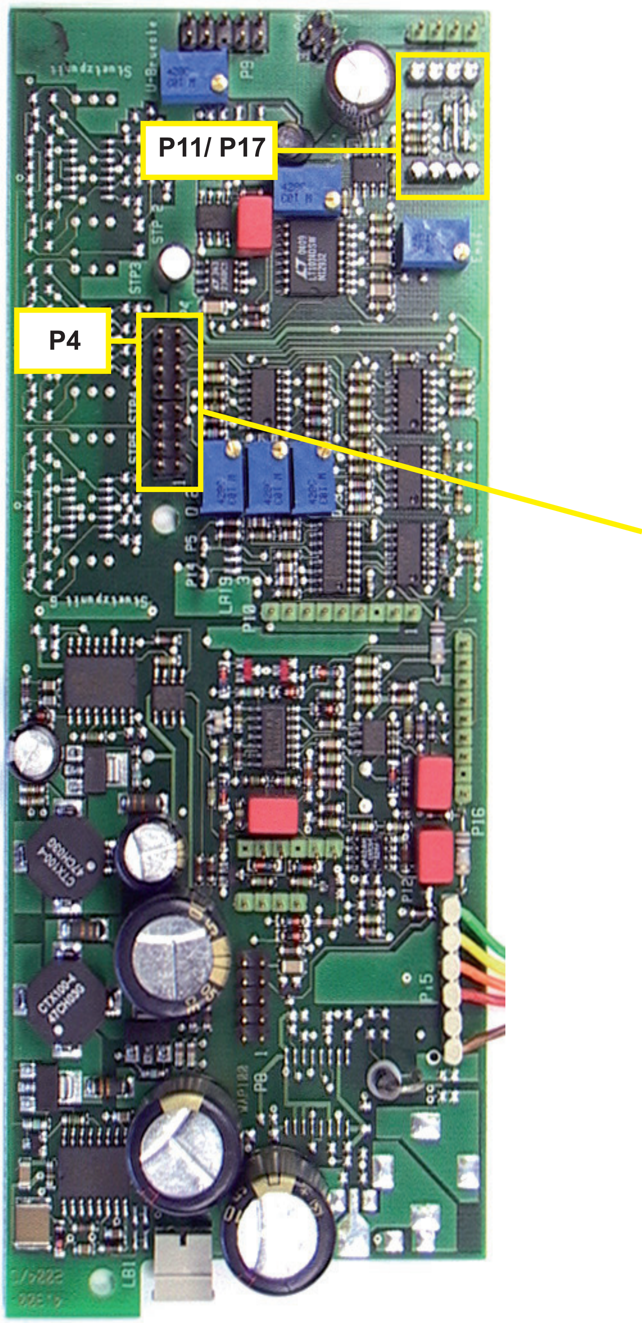


Alternatively the GND signal (-) is accessible on the main board BKS, too: Locate X11 (☞ fig. 8-3, page 8-16) .

The bridge voltage depends on range and sample gas and should be between 3V and 5V.

Only if the WAP 100 board has been replaced, it is necessary to adjust the voltage with potentiometer R60.

8.4 Troubleshooting on Components



Step 4:

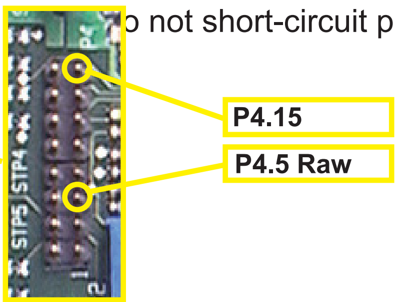
To **adjust the physical zero point**:

Apply zero gas to the analyzer.

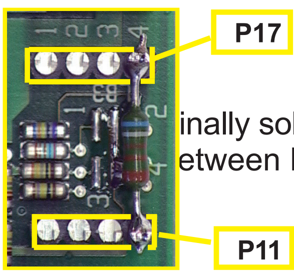
Connect the DVM to the following pins:
P4.5 Raw signal (+)
P4.15 Bridge voltage (-); GND

CAUTION!

o not short-circuit pins!

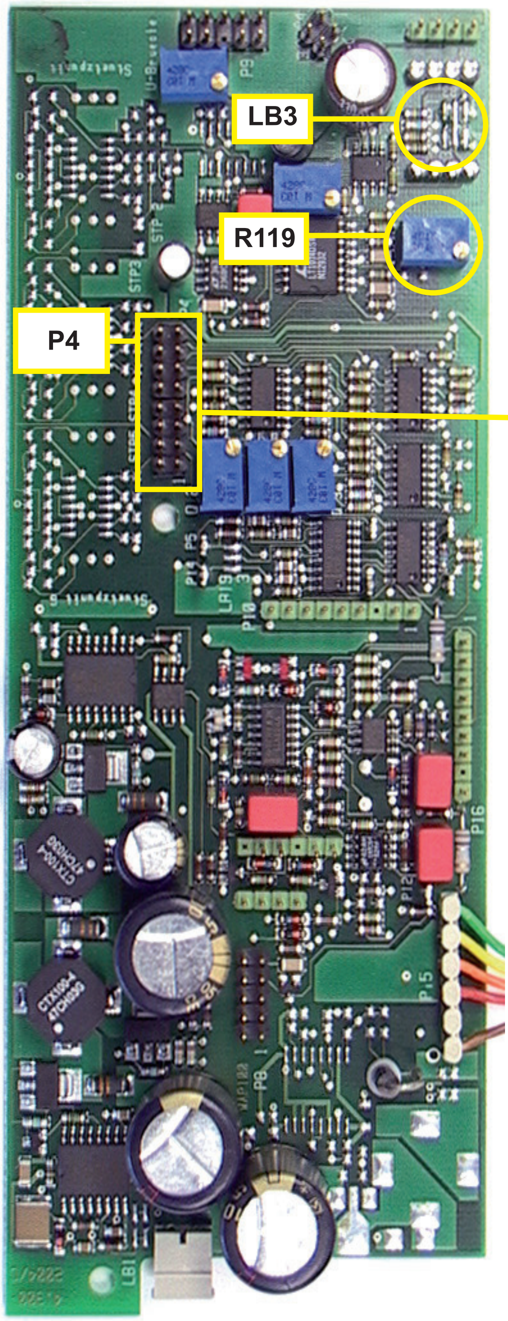


To adjust the physical zero point, it is necessary to install a resistor between **P11/ P17** at position 1, 2, 3 or 4 (the following figure shows it at position 4).
The position and value depends on the individual cell parameters. Proper configuration is a result of "try and error"!
Change resistor and/or position until the voltage is **0 V ± 500 mV**.



inally solder in the resistor etween P11/ P17.

8.4 Troubleshooting on Components

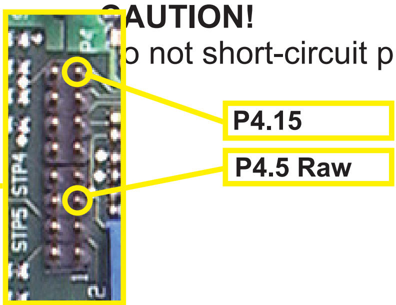


Step 5:

To **adjust the physical span**:
Apply span gas to the analyzer.

Do not disconnect the DVM:
P4.5 Raw signal (+)
P4.15 Bridge voltage (-); GND

CAUTION!
Do not short-circuit pins!



Adjust the voltage to **10V** utilizing **R119**.

If 10V is not within the adjustable range, it is necessary to change the signal amplification with **solder bridge LB3**:

For an amplification factor of	close
20 150 300 500	1-5 3-5 4-5 2-3-4-5

Step 6:

Now once more check the zero point:

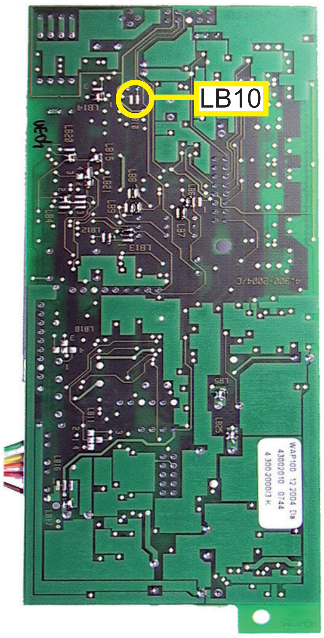
Apply zero gas to the analyzer.

Do not disconnect the DVM:

The voltage should be **0 V ± 500 mV.**

If it does not, repeat from step 3!

8.4 Troubleshooting on Components



Step 7:

To **finetune the physical zero point**:

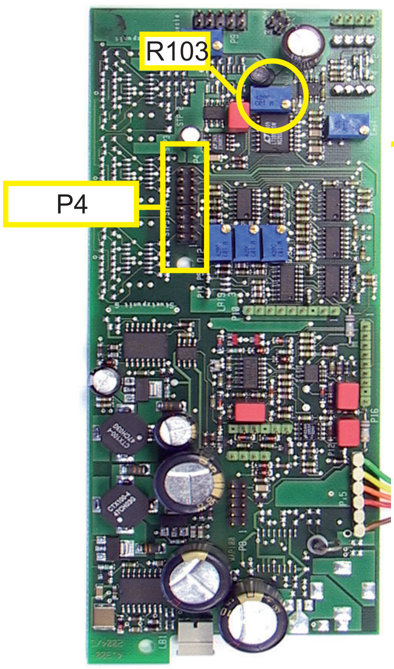
Close solder bridge LB10.

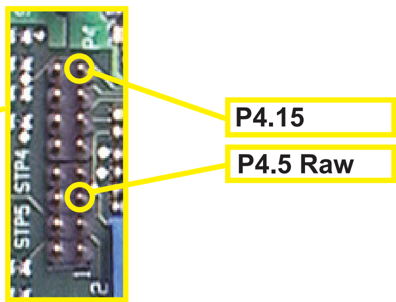
Apply zero gas to the analyzer.

Do not disconnect the DVM:
P4.5 Raw signal (+)
P4.15 Bridge voltage (-); GND

CAUTION!
Do not short-circuit pins!

Now you can finetune the zero point to a minimum value, using R103.





Check the zero point with **zero gas** again and perform a **zero calibration**.

Check the full scale signal (10V at P4.5) with **span gas** and perform a **span calibration**.

This step completes the adjustment of output procedure.

Chapter 9
Modbus Functions

9.1 Abstract

This chapter lists all Modbus functions and registers supported by X-STREAM gas analyzers.

Refer to the *www.Modbus-IDA.org* website for detailled documentation about programming the interface. At date of creation of this instruc-tion manual the following documents were used:

- MODBUS Protocol Specification: Modbus_Application_Protocol_V1_1a.pdf
- MODBUS Serial Line Implementation Guide: Modbus_over_serial_line_V1.pdf.

For a list of

supported functions ☞ 9.2, page 9-2

supported parameters and registers,
ordered by parameter tag name ☞ 9.3, page 9-2
ordered by register number ☞ 9.4, page 9-22

9.1.1 Modbus TCP/IP

Before using Modbus TCP/IP take care to configure the communication properly:

☞ 6.2.3.6, page 6-45.

For Modbus TCP/IP the analyzer is factory configured to support DHCP servers: The moment, the powered instrument is connected to a DHCP server via ethernet, it will receive a valid IP address and become visible in the network.

If a DHCP server is not available, special software is downloadable to configure the ethernet port.

Download the configuration utility software for the installed **XPort AR** from:
http://www.lantronix.com/support/downloads.html

9.2 Supported Functions

Modbus Function	Function Code		Note [1)]
	decimal	(hex)	
ReadCoils	01	(0x01)	for registers of 2000
ReadDiscreteInputs	02	(0x02)	for registers of 1000
ReadHoldingRegisters	03	(0x03)	for registers of 3000, 8000, 9000
ReadInputRegisters	04	(0x04)	for registers of 4000, 8000, 9000
WriteSingleCoil	05	(0x05)	for registers of 2000
WriteSingleRegister	06	(0x06)	for registers of 3000
Diagnostic	08	(0x08)	sub function "00 = Return Query Data" only
WriteMultipleCoils	15	(0x0F)	for registers of 2000
WriteMultipleRegisters	16	(0x10)	for registers of 3000, 8000, 9000
EncapsulatedInterfaceTransport	43	(0x28)	sub function "0x60" and "0x81" only (to be used for configuration file transfer)

[1)] Registers ranges 8000 and 9000 are **Daniel** long word or floating point registers.
To calculate the related **Modicon** registers use the following table:

Daniel		Modicon	Data type
8001 - 8499	equals	5001 - 5999	long word
9001 - 9999	equals	6001 - 7999	floating point

or ☞ the following pages for comparisons of all Daniel and Modicon registers.

9.3 List Of Parameters And Registers - Sorted By Tag Name

Note!
The client access column in the following list provides information about the read only (RO) or read/write (R/W) access of each parameter.
All parameters with read/write access and tag names beginning with "Service." require entering the service level access code into the register 3008 for parameter "Service.RemoteSecurity" to enable write access.

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Control.AcknowledgeStates	2038	2038	Boolean	R/W	1=Acknowledge device‘s states, 0=no effect
Control.AnalogOut.ZoomState1	3257	3257	Word	R/W	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
Control.AnalogOut.ZoomState2	3258	3258	Word	R/W	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
Control.AnalogOut.ZoomState3	3259	3259	Word	R/W	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
Control.AnalogOut.ZoomState4	3260	3260	Word	R/W	ZoomStatus AOut4 (0=Normal, 1=Zoomed)
Control.ApplyGas.PumpState	2033	2033	Boolean	R/W	0=Off, 1=On
Control.ApplyGas.SampleValve	2021	2021	Boolean	R/W	0=close all valves, 1=open sample valve
Control.ApplyGas.SpanValve1	2029	2029	Boolean	R/W	0=open sample valve, 1=open span valve comp1
Control.ApplyGas.SpanValve2	2030	2030	Boolean	R/W	0=open sample valve, 1=open span valve comp2
Control.ApplyGas.SpanValve3	2031	2031	Boolean	R/W	0=open sample valve, 1=open span valve comp3
Control.ApplyGas.SpanValve4	2032	2032	Boolean	R/W	0=open sample valve, 1=open span valve comp4
Control.ApplyGas.ZeroValve1	2025	2025	Boolean	R/W	0=open sample valve, 1=open zero valve comp1
Control.ApplyGas.ZeroValve2	2026	2026	Boolean	R/W	0=open sample valve, 1=open zero valve comp2
Control.ApplyGas.ZeroValve3	2027	2027	Boolean	R/W	0=open sample valve, 1=open zero valve comp3
Control.ApplyGas.ZeroValve4	2028	2028	Boolean	R/W	0=open sample valve, 1=open zero valve comp4
Control.Calibration.Calibration_Cancel	2012	2012	Boolean	R/W	Cancel any calibration (1=cancel)
Control.Calibration.Span_1	2006	2006	Boolean	R/W	Span calibration comp1 (1=start)
Control.Calibration.Span_2	2007	2007	Boolean	R/W	Span calibration comp2 (1=start)
Control.Calibration.Span_3	2008	2008	Boolean	R/W	Span calibration comp3 (1=start)
Control.Calibration.Span_4	2009	2009	Boolean	R/W	Span calibration comp4 (1=start)
Control.Calibration.Span_All	2010	2010	Boolean	R/W	Span calibration all (1=start)
Control.Calibration.Zero_1	2001	2001	Boolean	R/W	Zero calibration comp1 (1=start)
Control.Calibration.Zero_2	2002	2002	Boolean	R/W	Zero calibration comp2 (1=start)
Control.Calibration.Zero_3	2003	2003	Boolean	R/W	Zero calibration comp3 (1=start)
Control.Calibration.Zero_4	2004	2004	Boolean	R/W	Zero calibration comp4 (1=start)
Control.Calibration.Zero_All	2005	2005	Boolean	R/W	Zero calibration all (1=start)
Control.Calibration.ZeroSpan_All	2011	2011	Boolean	R/W	Zero + span calibration all (1=start)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address Modicon	Address Daniel	Data Type	Client Access	Description
Control.RemoteExclusive	2039	2039	Boolean	R/W	Device access mode (0=Remote&LOI, 1=RemoteOnly)
Control.ResetDevice	2037	2037	Boolean	R/W	reset the device: 0=none, 1=reset
Info.ChannelId1	3201… 3210	3201… 3210	String	RO	channel identification text of comp1
Info.ChannelId2	3211… 3220	3211… 3220	String	RO	channel identification text of comp2
Info.ChannelId3	3221… 3230	3221… 3230	String	RO	channel identification text of comp3
Info.ChannelId4	3231… 3240	3231… 3240	String	RO	channel identification text of comp4
Info.EndOfRange1	6069… 6070	9035	Float	RO	end of range of component1
Info.EndOfRange2	6071… 6072	9036	Float	RO	end of range of component2
Info.EndOfRange3	6073… 6074	9037	Float	RO	end of range of component3
Info.EndOfRange4	6075… 6076	9038	Float	RO	end of range of component4
Info.InstalledOptions.DIO_Installed	3030	3030	Word	RO	dig. IO installed: 0=None, 1=Card1, 2 = Card1+2
Info.InstalledOptions.FlowAlarmInstalled	3023	3023	Word	RO	digital flow alarm installed
Info.InstalledOptions.FlowSensorAssigned1	3273	3273	Word	RO	flow sensor assigned to comp1 (0=None, etc.)
Info.InstalledOptions.FlowSensorAssigned2	3274	3274	Word	RO	flow sensor assigned to comp2 (0=None, etc.)
Info.InstalledOptions.FlowSensorAssigned3	3275	3275	Word	RO	flow sensor assigned to comp3 (0=None, etc.)
Info.InstalledOptions.FlowSensorAssigned4	3276	3276	Word	RO	flow sensor assigned to comp4 (0=None, etc.)
Info.InstalledOptions.PressureSensorIn-stalled	3027	3027	Word	RO	pressure (0=manual,1=intSens,2=cyclR emote,3=comp2)
Info.InstalledOptions.PumpInstalled	3043	3043	Word	RO	pump is installed and controlled by device
Info.InstalledOptions.SIntInstalled	3025	3025	Word	RO	serial interface hardware installed
Info.InstalledOptions.TempSensorAssigned1	3277	3277	Word	RO	temp sensor assigned to comp1 (0=None, etc.)
Info.InstalledOptions.TempSensorAssigned2	3278	3278	Word	RO	temp sensor assigned to comp2 (0=None, etc.)
Info.InstalledOptions.TempSensorAssigned3	3279	3279	Word	RO	temp sensor assigned to comp3 (0=None, etc.)
Info.InstalledOptions.TempSensorAssigned4	3280	3280	Word	RO	temp sensor assigned to comp4 (0=None, etc.)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Info.InstalledOptions.ValvesInstalled	3031	3031	Word	RO	kind of valve unit installed (0=No,1=int., 2=ext.,3=int.&ext.)
Info.InterfaceID	4033	4033	Word	RO	Interface which is communicated to (1 = Process, 2 = Service)
Info.LowestEndRange1	6077…6078	9039	Float	RO	min. range of comp1 that keeps specs
Info.LowestEndRange2	6079…6080	9040	Float	RO	min. range of comp2 that keeps specs
Info.LowestEndRange3	6081…6082	9041	Float	RO	min. range of comp3 that keeps specs
Info.LowestEndRange4	6083…6084	9042	Float	RO	min. range of comp4 that keeps specs
Info.ManufacturingInfo	3281…3296	3281…3296	String	RO	Infos stored for manufacturing purpo-ses
Info.ProgramVersion	3241…3256	3241…3256	String	RO	software release version
Info.SensorBuild	4030	4030	Word	RO	Build number of sensor firmware
Info.SensorVersion	4029	4029	Word	RO	Version number of sensor firmware
Info.SerialNumber	3196…3200	3196…3200	String	RO	serial number of the device
Info.StartOfRange1	6061…6062	9031	Float	RO	start of range of component1
Info.StartOfRange2	6063…6064	9032	Float	RO	start of range of component2
Info.StartOfRange3	6065…6066	9033	Float	RO	start of range of component3
Info.StartOfRange4	6067…6068	9034	Float	RO	start of range of component4
Service.AccessMode	4010	4010	Word	RO	0=Normal, 3=Service
Service.AnalogOut.AOutAdjustEnd1	3309	3309	Short	R/W	gain value for fine adjustment of analog output1
Service.AnalogOut.AOutAdjustEnd2	3310	3310	Short	R/W	gain value for fine adjustment of analog output2
Service.AnalogOut.AOutAdjustEnd3	3311	3311	Short	R/W	gain value for fine adjustment of analog output3
Service.AnalogOut.AOutAdjustEnd4	3312	3312	Short	R/W	gain value for fine adjustment of analog output4
Service.AnalogOut.AOutAdjustStart1	3305	3305	Short	R/W	offset value for fine adjustment of ana-log output1
Service.AnalogOut.AOutAdjustStart2	3306	3306	Short	R/W	offset value for fine adjustment of ana-log output2
Service.AnalogOut.AOutAdjustStart3	3307	3307	Short	R/W	offset value for fine adjustment of ana-log output3

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Service.AnalogOut.AOutAdjustStart4	3308	3308	Short	R/W	offset value for fine adjustment of analog output4
Service.Communication.SvcModbusFt32	3028	3028	Word	R/W	Svc: 32bit regs format (0=Daniel, 1=Modicon, 2=Modicon swap)
Service.General.ChannelId1	3201… 3210	3201… 3210	String	R/W	channel identification text of comp1
Service.General.ChannelId2	3211… 3220	3211… 3220	String	R/W	channel identification text of comp2
Service.General.ChannelId3	3221… 3230	3221… 3230	String	R/W	channel identification text of comp3
Service.General.ChannelId4	3231… 3240	3231… 3240	String	R/W	channel identification text of comp4
Service.General.EmersonAccCode	3186… 3189	3186… 3189	String	R/W	code for getting LOI access to Emerson areas
Service.General.EmersonAccMode	3190	3190	Word	RO	mode for getting LOI access to Emerson areas
Service.General.NumberChannels	3001	3001	Word	R/W	number of built-in component channels
Service.General.SerialNumber	3196… 3200	3196… 3200	String	R/W	serial number of the device
Service.General.WarmupTime	3002	3002	Word	R/W	time in secs that is used for warmup phase
Service.InstalledOptions.AOutNumber	3024	3024	Word	R/W	number of installed analog outputs
Service.InstalledOptions.DIO_Installed	3030	3030	Word	R/W	dig. IO installed: 0=None, 1=Card1, 2=Card1+2
Service.InstalledOptions.FlowAlarmInstalled	3023	3023	Word	R/W	digital flow alarm installed
Service.InstalledOptions.FlowSensorAssigned1	3273	3273	Word	R/W	flow sensor assigned to comp1 (0=None, etc.)
Service.InstalledOptions.FlowSensorAssigned2	3274	3274	Word	R/W	flow sensor assigned to comp2 (0=None, etc.)
Service.InstalledOptions.FlowSensorAssigned3	3275	3275	Word	R/W	flow sensor assigned to comp3 (0=None, etc.)
Service.InstalledOptions.FlowSensorAssigned4	3276	3276	Word	R/W	flow sensor assigned to comp4 (0=None, etc.)
Service.InstalledOptions.PressureSensorInstalled	3027	3027	Word	R/W	pressure (0=manual,1=intSens,2=cycl Remote)
Service.InstalledOptions.PumpInstalled	3043	3043	Word	R/W	pump is installed and controlled by device
Service.InstalledOptions.SIntInstalled	3025	3025	Word	R/W	serial interface hardware installed
Service.InstalledOptions.TempSensorAssigned1	3277	3277	Word	R/W	temp sensor assigned to comp1 (0=None, etc.)
Service.InstalledOptions.TempSensorAssigned2	3278	3278	Word	R/W	temp sensor assigned to comp2 (0=None, etc.)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Service.InstalledOptions.TempSensorAssigned3	3279	3279	Word	R/W	temp sensor assigned to comp3 (0=None, etc.)
Service.InstalledOptions.TempSensorAssigned4	3280	3280	Word	R/W	temp sensor assigned to comp4 (0=None, etc.)
Service.InstalledOptions.ValvesInstalled	3031	3031	Word	R/W	kind of valve unit installed (0=No,1=int., 2=ext.,3=int.&ext.)
Service.Linearizer.Unlinear	3007	3007	Word	R/W	activates unlinear concentration measurement (0 = no, 1 = yes)
Service.LOI.HideOptionLines	3161	3161	Word	R/W	hides menu lines if depending on installed options: 0=Off 1=On
Service.LOI.KeyDebounceCount	3164	3164	Word	R/W	number of key scans for validating
Service.Measurement.DifferenceMeasurement	3015	3015	Word	R/W	bitfield to enable difference mode (b0=Ch1, b1=Ch2 etc.)
Service.Measurement.DSPresetCount	3301	3301	Word	R/W	counter of DSP resets
Service.Measurement.EndOfRange1	6069… 6070	9035	Float	R/W	end of range of component1
Service.Measurement.EndOfRange2	6071… 6072	9036	Float	R/W	end of range of component2
Service.Measurement.EndOfRange3	6073… 6074	9037	Float	R/W	end of range of component3
Service.Measurement.EndOfRange4	6075… 6076	9038	Float	R/W	end of range of component4
Service.Measurement.LowestEndRange1	6077… 6078	9039	Float	R/W	min. range of comp1 that keeps specs
Service.Measurement.LowestEndRange2	6079… 6080	9040	Float	R/W	min. range of comp2 that keeps specs
Service.Measurement.LowestEndRange3	6081… 6082	9041	Float	R/W	min. range of comp3 that keeps specs
Service.Measurement.LowestEndRange4	6083… 6084	9042	Float	R/W	min. range of comp4 that keeps specs
Service.Measurement.MaxConcePercent1	3011	3011	Word	R/W	max. allowed values in % of range for cal gases and conc limits
Service.Measurement.MaxConcePercent2	3012	3012	Word	R/W	max. allowed values in % of range for cal gases and conc limits
Service.Measurement.MaxConcePercent3	3013	3013	Word	R/W	max. allowed values in % of range for cal gases and conc limits
Service.Measurement.MaxConcePercent4	3014	3014	Word	R/W	max. allowed values in % of range for cal gases and conc limits
Service.Measurement.PV1	6001… 6002	9001	Float	R/W	Concentration of component1 (in ppm)
Service.Measurement.PV2	6003… 6004	9002	Float	R/W	Concentration of component2 (in ppm)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Service.Measurement.PV3	6005… 6006	9003	Float	R/W	Concentration of component3 (in ppm)
Service.Measurement.PV4	6007… 6008	9004	Float	R/W	Concentration of component4 (in ppm)
Service.Measurement.Simulation	3191	3191	Word	R/W	bitfield for enabling simulation of single components
Service.Measurement.StartOfRange1	6061… 6062	9031	Float	RO	start of range of component1
Service.Measurement.StartOfRange2	6063… 6064	9032	Float	RO	start of range of component2
Service.Measurement.StartOfRange3	6065… 6066	9033	Float	RO	start of range of component3
Service.Measurement.StartOfRange4	6067… 6068	9034	Float	RO	start of range of component4
Service.Measurement.StartRawMeas1	3192	3192	Word	R/W	start raw measurement of component1
Service.Measurement.StartRawMeas2	3193	3193	Word	R/W	start raw measurement of component2
Service.Measurement.StartRawMeas3	3194	3194	Word	R/W	start raw measurement of component3
Service.Measurement.StartRawMeas4	3195	3195	Word	R/W	start raw measurement of component4
Service.RemoteSecurity	3008	3008	Word	R/W	Input Code to enable service accesss
Service.Status.NAMUR.FailureMask	5021… 5022	8011	DWord	R/W	Bitmask that disables failure sources
Service.Status.NAMUR.FctCheckMask	5027… 5028	8014	DWord	R/W	Bitmask that disables NAMUR Fct-Check sources
Service.Status.NAMUR.MaintMask	5023… 5024	8012	DWord	R/W	Bitmask that disables NAMUR maintenance request sources
Service.Status.NAMUR.OffSpecMask	5025… 5026	8013	DWord	R/W	Bitmask that disables NAMUR OffSpec sources
Service.TempControl.TempCheckEnable1	3109	3109	Word	R/W	check of comp1 for correct temperature: 0=Off 1=Temp1 2=Temp2
Service.TempControl.TempCheckEnable2	3110	3110	Word	R/W	check of comp2 for correct temperature: 0=Off 1=Temp1 2=Temp2
Service.TempControl.TempCheckEnable3	3111	3111	Word	R/W	check of comp3 for correct temperature: 0=Off 1=Temp1 2=Temp2
Service.TempControl.TempCheckEnable4	3112	3112	Word	R/W	check of comp4 for correct temperature: 0=Off 1=Temp1 2=Temp2
Service.TempControl.TempHighLimit1	3117	3117	Word	R/W	high limit in °C for temperature check of comp1
Service.TempControl.TempHighLimit2	3118	3118	Word	R/W	high limit in °C for temperature check of comp2
Service.TempControl.TempHighLimit3	3119	3119	Word	R/W	high limit in °C for temperature check of comp3

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Service.TempControl.TempHighLimit4	3120	3120	Word	R/W	high limit in °C for temperature check of comp4
Service.TempControl.TempLowLimit1	3113	3113	Word	R/W	low limit in °C for temperature check of comp1
Service.TempControl.TempLowLimit2	3114	3114	Word	R/W	low limit in °C for temperature check of comp2
Service.TempControl.TempLowLimit3	3115	3115	Word	R/W	low limit in °C for temperature check of comp3
Service.TempControl.TempLowLimit4	3116	3116	Word	R/W	low limit in °C for temperature check of comp4
Setup.Alarms.FlowAlarmTyp1	3297	3297	Word	R/W	alarm type flow limit comp1: 0=offFS 1=lowFS
Setup.Alarms.FlowAlarmTyp2	3298	3298	Word	R/W	alarm type flow limit comp2: 0=offFS 1=lowFS
Setup.Alarms.FlowAlarmTyp3	3299	3299	Word	R/W	alarm type flow limit comp3: 0=offFS 1=lowFS
Setup.Alarms.FlowAlarmTyp4	3300	3300	Word	R/W	alarm type flow limit comp4: 0=offFS 1=lowFS
Setup.Alarms.FlowLimLevel1	6201… 6202	9101	Float	R/W	flow alarm level (l/min) for comp1
Setup.Alarms.FlowLimLevel2	6203… 6204	9102	Float	R/W	flow alarm level (l/min) for comp3
Setup.Alarms.FlowLimLevel3	6205… 6206	9103	Float	R/W	flow alarm level (l/min) for comp3
Setup.Alarms.FlowLimLevel4	6207… 6208	9104	Float	R/W	flow alarm level (l/min) for comp4
Setup.Alarms.Limit1AlarmTyp1	3101	3101	Word	R/W	alarm type limit1 comp1: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit1AlarmTyp2	3102	3102	Word	R/W	alarm type limit1 comp2: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit1AlarmTyp3	3103	3103	Word	R/W	alarm type limit1 comp3: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit1AlarmTyp4	3104	3104	Word	R/W	alarm type limit1 comp4: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit1Level1	6161… 6162	9081	Float	R/W	comp1 alarm level (ppm) for limit1
Setup.Alarms.Limit1Level2	6163… 6164	9082	Float	R/W	comp2 alarm level (ppm) for limit1
Setup.Alarms.Limit1Level3	6165… 6166	9083	Float	R/W	comp3 alarm level (ppm) for limit1
Setup.Alarms.Limit1Level4	6167… 6168	9084	Float	R/W	comp4 alarm level (ppm) for limit1

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.Alarms.Limit2AlarmTyp1	3105	3105	Word	R/W	alarm type limit2 comp1: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit2AlarmTyp2	3106	3106	Word	R/W	alarm type limit2 comp2: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit2AlarmTyp3	3107	3107	Word	R/W	alarm type limit2 comp3: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit2AlarmTyp4	3108	3108	Word	R/W	alarm type limit2 comp4: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
Setup.Alarms.Limit2Level1	6169… 6170	9085	Float	R/W	comp1 alarm level (ppm) for limit2
Setup.Alarms.Limit2Level2	6171… 6172	9086	Float	R/W	comp2 alarm level (ppm) for limit2
Setup.Alarms.Limit2Level3	6173… 6174	9087	Float	R/W	comp3 alarm level (ppm) for limit2
Setup.Alarms.Limit2Level4	6175… 6176	9088	Float	R/W	comp4 alarm level (ppm) for limit2
Setup.Alarms.LimitHysteresis1	6177… 6178	9089	Float	R/W	alarm hysteresis for limits of comp1 in percent of range
Setup.Alarms.LimitHysteresis2	6179… 6180	9090	Float	R/W	alarm hysteresis for limits of comp2 in percent of range
Setup.Alarms.LimitHysteresis3	6181… 6182	9091	Float	R/W	alarm hysteresis for limits of comp3 in percent of range
Setup.Alarms.LimitHysteresis4	6183… 6184	9092	Float	R/W	alarm hysteresis for limits of comp4 in percent of range
Setup.Calibration.Auto.AutoZeroSpanTim-eInterval	3098	3098	Word	R/W	time interval in hours for automatic zero&span calibrations
Setup.Calibration.Auto.AutoZeroStartHours	3096	3096	Word	R/W	hour part for next start of automatic zero calibration
Setup.Calibration.Auto.AutoZeroStartMinutes	3097	3097	Word	R/W	minute part for next start of automatic zero calibration
Setup.Calibration.Auto.AutoZeroTimeInterval	3095	3095	Word	R/W	time interval in hours for automatic zero calibrations
Setup.Calibration.Auto.AutoZSpanStartHours	3099	3099	Word	R/W	hour part for next start of automatic zero&span calibrations
Setup.Calibration.Auto.AutoZSpanStartMi-nutes	3100	3100	Word	R/W	minute part for next start of automatic zero&span calibrations
Setup.Calibration.FlushingPeriod	3041	3041	Word	R/W	purge delay time (in secs) for gas supply
Setup.Calibration.HoldStatus	3042	3042	Word	R/W	hold analog outputs and alarms during non sample gas flowing
Setup.Calibration.RestoreCalibSpan1	2017	2017	Boolean	R/W	restore span calibration parameters from user memory for comp1

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.Calibration.RestoreCalibSpan2	2018	2018	Boolean	R/W	restore span calibration parameters from user memory for comp2
Setup.Calibration.RestoreCalibSpan3	2019	2019	Boolean	R/W	restore span calibration parameters from user memory for comp3
Setup.Calibration.RestoreCalibSpan4	2020	2020	Boolean	R/W	restore span calibration parameters from user memory for comp4
Setup.Calibration.RestoreCalibZero1	2013	2013	Boolean	R/W	restore zero calibration parameters from user memory for comp1
Setup.Calibration.RestoreCalibZero2	2014	2014	Boolean	R/W	restore zero calibration parameters from user memory for comp2
Setup.Calibration.RestoreCalibZero3	2015	2015	Boolean	R/W	restore zero calibration parameters from user memory for comp3
Setup.Calibration.RestoreCalibZero4	2016	2016	Boolean	R/W	restore zero calibration parameters from user memory for comp4
Setup.Calibration.SpanGasValue1	6121… 6122	9061	Float	R/W	value for comp1 (in ppm) which a span calibration adjusts to
Setup.Calibration.SpanGasValue2	6123… 6124	9062	Float	R/W	value for comp2 (in ppm) which a span calibration adjusts to
Setup.Calibration.SpanGasValue3	6125… 6126	9063	Float	R/W	value for comp3 (in ppm) which a span calibration adjusts to
Setup.Calibration.SpanGasValue4	6127… 6128	9064	Float	R/W	value for comp4 (in ppm) which a span calibration adjusts to
Setup.Calibration.ToleranceCheck	3021	3021	Word	R/W	check deviation tolerance (0=Off,1=On/AutoClear,2=On)
Setup.Calibration.Valves.SpanValveAssign1	3036	3036	Word	R/W	assigns span gas of comp1 to valves
Setup.Calibration.Valves.SpanValveAssign2	3037	3037	Word	R/W	assigns span gas of comp2 to valves
Setup.Calibration.Valves.SpanValveAssign3	3038	3038	Word	R/W	assigns span gas of comp3 to valves
Setup.Calibration.Valves.SpanValveAssign4	3039	3039	Word	R/W	assigns span gas of comp4 to valves
Setup.Calibration.Valves.ZeroValveAssign1	3032	3032	Word	R/W	assigns zero gas of comp1 to valves
Setup.Calibration.Valves.ZeroValveAssign2	3033	3033	Word	R/W	assigns zero gas of comp2 to valves
Setup.Calibration.Valves.ZeroValveAssign3	3034	3034	Word	R/W	assigns zero gas of comp3 to valves
Setup.Calibration.Valves.ZeroValveAssign4	3035	3035	Word	R/W	assigns zero gas of comp4 to valves
Setup.Calibration.ZeroGasValue1	6101… 6102	9051	Float	R/W	value for comp1 (in ppm) which a zero calibration adjusts to
Setup.Calibration.ZeroGasValue2	6103… 6104	9052	Float	R/W	value for comp2 (in ppm) which a zero calibration adjusts to
Setup.Calibration.ZeroGasValue3	6105… 6106	9053	Float	R/W	value for comp3 (in ppm) which a zero calibration adjusts to
Setup.Calibration.ZeroGasValue4	6107… 6108	9054	Float	R/W	value for comp4 (in ppm) which a zero calibration adjusts to
Setup.Communication.SIntModbusFt32	3026	3026	Word	R/W	32bit regs format (0=Daniel, 1=Modicon, 2=Modicon swap)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.Display.Component.DecimalPoint1	3128	3128	Word	R/W	decimal points displayed for component1
Setup.Display.Component.DecimalPoint2	3138	3138	Word	R/W	decimal points displayed for component2
Setup.Display.Component.DecimalPoint3	3148	3148	Word	R/W	decimal points displayed for component3
Setup.Display.Component.DecimalPoint4	3158	3158	Word	R/W	decimal points displayed for component4
Setup.Display.Component.PrimVariableName1	3121… 3124	3121… 3124	String	R/W	displayed tag for component1
Setup.Display.Component.PrimVariableName2	3131… 3134	3131… 3134	String	R/W	displayed tag for component2
Setup.Display.Component.PrimVariableName3	3141… 3144	3141… 3144	String	R/W	displayed tag for component3
Setup.Display.Component.PrimVariableName4	3151… 3154	3151… 3154	String	R/W	displayed tag for component4
Setup.Display.Component.PrimVariableUnit1	3125… 3127	3125… 3127	String	R/W	unit displayed for comp1
Setup.Display.Component.PrimVariableUnit2	3135… 3137	3135… 3137	String	R/W	unit displayed for comp2
Setup.Display.Component.PrimVariableUnit3	3145… 3147	3145… 3147	String	R/W	unit displayed for comp3
Setup.Display.Component.PrimVariableUnit4	3155… 3157	3155… 3157	String	R/W	unit displayed for comp4
Setup.Display.Component.PVAunitFactor1	6149… 6150	9075	Float	R/W	factor to convert ppm into displayed PrimVariableUnit1
Setup.Display.Component.PVAunitFactor2	6151… 6152	9076	Float	R/W	factor to convert ppm into displayed PrimVariableUnit2
Setup.Display.Component.PVAunitFactor3	6153… 6154	9077	Float	R/W	factor to convert ppm into displayed PrimVariableUnit3
Setup.Display.Component.PVAunitFactor4	6155… 6156	9078	Float	R/W	factor to convert ppm into displayed PrimVariableUnit4
Setup.Display.Component.PVAunitOffset1	6141… 6142	9071	Float	R/W	offset to convert ppm into displayed PrimVariableUnit1
Setup.Display.Component.PVAunitOffset2	6143… 6144	9072	Float	R/W	offset to convert ppm into displayed PrimVariableUnit2
Setup.Display.Component.PVAunitOffset3	6145… 6146	9073	Float	R/W	offset to convert ppm into displayed PrimVariableUnit3
Setup.Display.Component.PVAunitOffset4	6147… 6148	9074	Float	R/W	offset to convert ppm into displayed PrimVariableUnit4
Setup.Display.Lang3Name	3165	3165	String	R/W	LOI‘s 3rd language (according ISO 639-1)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.Display.Language	3162	3162	Word	R/W	LOI's language (0=EN, 1=DE, 2=3rd language)
Setup.Display.LOIAutoHome	3163	3163	Word	R/W	Auto ‚Home' for LOI (0=Never, 1=1minute, 2=10minutes)
Setup.Display.MeasureLines.MeasLine1	3166	3166	Word	R/W	signal assigned to line1 of 1st measurement display(0..n)
Setup.Display.MeasureLines.MeasLine2	3167	3167	Word	R/W	signal assigned to line2 of 1st measurement display(0..n)
Setup.Display.MeasureLines.MeasLine3	3168	3168	Word	R/W	signal assigned to line3 of 1st measurement display(0..n)
Setup.Display.MeasureLines.MeasLine4	3169	3169	Word	R/W	signal assigned to line4 of 1st measurement display(0..n)
Setup.Display.MeasureLines.MeasLine5	3313	3313	Word	R/W	signal assigned to line1 of 2nd measurement display(0..n)
Setup.Display.MeasureLines.MeasLine6	3314	3314	Word	R/W	signal assigned to line2 of 2nd measurement display(0..n)
Setup.Display.MeasureLines.MeasLine7	3315	3315	Word	R/W	signal assigned to line3 of 2nd measurement display(0..n)
Setup.Display.MeasureLines.MeasLine8	3316	3316	Word	R/W	signal assigned to line4 of 2nd measurement display(0..n)
Setup.Display.MenuAccesss.AutoCodeMode	3170	3170	Word	R/W	defines how codes autom. locked (0=never,1=home,2=1minute)
Setup.Display.MenuAccesss.BasicAccessCode	3171… 3174	3171… 3174	String	R/W	user code for getting access to basic areas
Setup.Display.MenuAccesss.BasicAccMode	3175	3175	Word	R/W	mode for access to basic areas (0=allowed,1=code, 2=prohibited)
Setup.Display.MenuAccesss.ExpertAccessCode	3176… 3179	3176… 3179	String	R/W	user code for getting access to expert areas
Setup.Display.MenuAccesss.ExpertAccMode	3180	3180	Word	R/W	mode for access to expert areas (0=allowed,1=code,2=prohibited)
Setup.Display.MenuAccesss.SpecialAccessCode	3181… 3184	3181… 3184	String	R/W	user code for getting access to special areas
Setup.Display.MenuAccesss.SpecialAccMode	3185	3185	Word	R/W	mode for access special areas (0=allowed,1=code,2=prohibited)
Setup.Display.SecVars.FlowDecimalPoint	3150	3150	Word	R/W	decimal point position for flow displays
Setup.Display.SecVars.FlowUnit	3149	3149	Word	R/W	unit to display flows (0=??, 1=??)
Setup.Display.SecVars.PresDecimalPoint	3140	3140	Word	R/W	decimal point position for pressure displays
Setup.Display.SecVars.PressUnit	3139	3139	Word	R/W	unit to display pressures (0=Pa,1=hPa, 2=mbar,3=Bar,4=psig)
Setup.Display.SecVars.TempDecimalPoint	3130	3130	Word	R/W	decimal point position for temperature displays

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.Display.SecVars.TempUnit	3129	3129	Word	R/W	unit to display temperatures (0=°C, 1=°F)
Setup.In/Outputs.AnalogOut.AOutEndRange1	6093… 6094	9047	Float	R/W	level (ppm) where analoge output scaling ends for comp1
Setup.In/Outputs.AnalogOut.AOutEndRange2	6095… 6096	9048	Float	R/W	level (ppm) where analoge output scaling ends for comp2
Setup.In/Outputs.AnalogOut.AOutEndRange3	6097… 6098	9049	Float	R/W	level (ppm) where analoge output scaling ends for comp3
Setup.In/Outputs.AnalogOut.AOutEndRange4	6099… 6100	9050	Float	R/W	level (ppm) where analoge output scaling ends for comp4
Setup.In/Outputs.AnalogOut.AOutSignalAssign1	3017	3017	Word	R/W	asgn AOut1(0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
Setup.In/Outputs.AnalogOut.AOutSignalAssign2	3018	3018	Word	R/W	asgn AOut2 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
Setup.In/Outputs.AnalogOut.AOutSignalAssign3	3019	3019	Word	R/W	asgn AOut3 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
Setup.In/Outputs.AnalogOut.AOutSignalAssign4	3020	3020	Word	R/W	asgn AOut4 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
Setup.In/Outputs.AnalogOut.AOutStartRange1	6085… 6086	9043	Float	R/W	level (ppm) where analoge output scaling starts for comp1
Setup.In/Outputs.AnalogOut.AOutStartRange2	6087… 6088	9044	Float	R/W	level (ppm) where analoge output scaling starts for comp2
Setup.In/Outputs.AnalogOut.AOutStartRange3	6089… 6090	9045	Float	R/W	level (ppm) where analoge output scaling starts for comp3
Setup.In/Outputs.AnalogOut.AOutStartRange4	6091… 6092	9046	Float	R/W	level (ppm) where analoge output scaling starts for comp4
Setup.In/Outputs.AnalogOut.AOutType	3016	3016	Word	R/W	AOut behavior (0=0_20,1=4_20,2=0_20L,3=4_20L,4=0_20H,5=4_20H)
Setup.In/Outputs.AnalogOut.Zoom1	3261	3261	Word	R/W	Zoom AOut1 (in %)
Setup.In/Outputs.AnalogOut.Zoom2	3262	3262	Word	R/W	Zoom AOut2 (in %)
Setup.In/Outputs.AnalogOut.Zoom3	3263	3263	Word	R/W	Zoom AOut3 (in %)
Setup.In/Outputs.AnalogOut.Zoom4	3264	3264	Word	R/W	Zoom AOut4 (in %)
Setup.In/Outputs.AnalogOut.ZoomControl1	3265	3265	Word	R/W	ZoomControl of AOut1 (0=Manual, 1=DigInput, 2=Auto)
Setup.In/Outputs.AnalogOut.ZoomControl2	3266	3266	Word	R/W	ZoomControl of AOut2 (0=Manual, 1=DigInput, 2=Auto)
Setup.In/Outputs.AnalogOut.ZoomControl3	3267	3267	Word	R/W	ZoomControl of AOut3 (0=Manual, 1=DigInput, 2=Auto)
Setup.In/Outputs.AnalogOut.ZoomControl4	3268	3268	Word	R/W	ZoomControl of AOut4 (0=Manual, 1=DigInput, 2=Auto)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.In/Outputs.AnalogOut.ZoomPosit1	3269	3269	Word	R/W	ZoomPosition AOut1 (0=LowScale, 1=HighScale)
Setup.In/Outputs.AnalogOut.ZoomPosit2	3270	3270	Word	R/W	ZoomPosition AOut2 (0=LowScale, 1=HighScale)
Setup.In/Outputs.AnalogOut.ZoomPosit3	3271	3271	Word	R/W	ZoomPosition AOut3 (0=LowScale, 1=HighScale)
Setup.In/Outputs.AnalogOut.ZoomPosit4	3272	3272	Word	R/W	ZoomPosition AOut4 (0=LowScale, 1=HighScale)
Setup.In/Outputs.AnalogOut.ZoomState1	3257	3257	Word	R/W	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
Setup.In/Outputs.AnalogOut.ZoomState2	3258	3258	Word	R/W	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
Setup.In/Outputs.AnalogOut.ZoomState3	3259	3259	Word	R/W	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
Setup.In/Outputs.AnalogOut.ZoomState4	3260	3260	Word	R/W	ZoomStatus AOut4 (0=Normal, 1=Zoomed)
Setup.In/Outputs.DigitalInOut.DIO1In.Input1	3081	3081	Word	R/W	signal assigned to Input1 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input2	3082	3082	Word	R/W	signal assigned to Input2 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input3	3083	3083	Word	R/W	signal assigned to Input3 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input4	3084	3084	Word	R/W	signal assigned to Input4 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input5	3085	3085	Word	R/W	signal assigned to Input5 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input6	3086	3086	Word	R/W	signal assigned to Input6 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1In.Input7	3087	3087	Word	R/W	signal assigned to Input7 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out1	3061	3061	Word	R/W	signal assigned to Output1 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out2	3062	3062	Word	R/W	signal assigned to Output2 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out3	3063	3063	Word	R/W	signal assigned to Output3 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out4	3064	3064	Word	R/W	signal assigned to Output4 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out5	3065	3065	Word	R/W	signal assigned to Output5 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out6	3066	3066	Word	R/W	signal assigned to Output6 of DIO-board#1

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.In/Outputs.DigitalInOut.DIO1Out.Out7	3067	3067	Word	R/W	signal assigned to Output7 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out8	3068	3068	Word	R/W	signal assigned to Output8 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO1Out.Out9	3069	3069	Word	R/W	signal assigned to Output9 of DIO-board#1
Setup.In/Outputs.DigitalInOut.DIO2In.Input1	3088	3088	Word	R/W	signal assigned to Input1 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input2	3089	3089	Word	R/W	signal assigned to Input2 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input3	3090	3090	Word	R/W	signal assigned to Input3 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input4	3091	3091	Word	R/W	signal assigned to Input4 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input5	3092	3092	Word	R/W	signal assigned to Input5 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input6	3093	3093	Word	R/W	signal assigned to Input6 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2In.Input7	3094	3094	Word	R/W	signal assigned to Input7 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out1	3071	3071	Word	R/W	signal assigned to Output1 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out2	3072	3072	Word	R/W	signal assigned to Output2 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out3	3073	3073	Word	R/W	signal assigned to Output3 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out4	3074	3074	Word	R/W	signal assigned to Output4 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out5	3075	3075	Word	R/W	signal assigned to Output5 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out6	3076	3076	Word	R/W	signal assigned to Output6 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out7	3077	3077	Word	R/W	signal assigned to Output7 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out8	3078	3078	Word	R/W	signal assigned to Output8 of DIO-board#2
Setup.In/Outputs.DigitalInOut.DIO2Out.Out9	3079	3079	Word	R/W	signal assigned to Output9 of DIO-board#2
Setup.In/Outputs.DigitalInOut.PSAOut.Relais1	3047	3047	Word	R/W	signal assigned to relais1 of PSA-board
Setup.In/Outputs.DigitalInOut.PSAOut.Relais2	3048	3048	Word	R/W	signal assigned to relais2 of PSA-board

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Setup.In/Outputs.DigitalInOut.PSAOut.Relais3	3049	3049	Word	R/W	signal assigned to relais3 of PSA-board
Setup.In/Outputs.DigitalInOut.PSAOut.Relais4	3050	3050	Word	R/W	signal assigned to relais4 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Pump1	3059	3059	Word	R/W	signal assigned to pump1 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Pump2	3060	3060	Word	R/W	signal assigned to pump2 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve1	3051	3051	Word	R/W	signal assigned to valve1 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve2	3052	3052	Word	R/W	signal assigned to valve2 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve3	3053	3053	Word	R/W	signal assigned to valve3 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve4	3054	3054	Word	R/W	signal assigned to valve4 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve5	3055	3055	Word	R/W	signal assigned to valve5 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve6	3056	3056	Word	R/W	signal assigned to valve6 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve7	3057	3057	Word	R/W	signal assigned to valve7 of PSA-board
Setup.In/Outputs.DigitalInOut.PSASHS.Valve8	3058	3058	Word	R/W	signal assigned to valve8 of PSA-board
Setup.Measurement.AirPressure	6017… 6018	9009	Float	R/W	pressure (in hPa), if no pressure sensor installed then input
Setup.Measurement.ResponseTime1	3003	3003	Word	R/W	signal damping (in secs) for gas change of comp1
Setup.Measurement.ResponseTime2	3004	3004	Word	R/W	signal damping (in secs) for gas change of comp2
Setup.Measurement.ResponseTime3	3005	3005	Word	R/W	signal damping (in secs) for gas change of comp3
Setup.Measurement.ResponseTime4	3006	3006	Word	R/W	signal damping (in secs) for gas change of comp4
Setup.SaveLoadUpdate.ConfigSaveLoad	3159	3159	Word	R/W	load/save memory: 0=load user, 1=load factory, 2=save user
Status.Calibration.AutoZeroStartHours	3096	3096	Word	RO	hour part for next start of automatic zero calibration
Status.Calibration.AutoZeroStartMinutes	3097	3097	Word	RO	minute part for next start of automatic zero calibration
Status.Calibration.AutoZSpanStartHours	3099	3099	Word	RO	hour part for next start of automatic zero&span calibrations

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Status.Calibration.AutoZSpanStartMinutes	3100	3100	Word	RO	minute part for next start of automatic zero&span calibrations
Status.Calibration.CalibrationCount	4005	4005	Word	RO	second decrementer for calibration and/or purging procedures
Status.Calibration.CalibrationState	4004	4004	Word	RO	0=None 1=valve 2=purge 3=Zstart 4=Sstart 5=Zwait 6=Swait 7=cance
Status.Calibration.CalValveState	4003	4003	Word	RO	current state of the valves: bit0=sample, b1=V4, b2=V1, b3=V2
Status.Calibration.FactZeroOffset1	6129… 6130	9065	Float	RO	zero correction value comp1 determined in factory
Status.Calibration.FactZeroOffset2	6131… 6132	9066	Float	RO	zero correction value comp2 determined in factory
Status.Calibration.FactZeroOffset3	6133… 6134	9067	Float	RO	zero correction value comp 3 determined in factory
Status.Calibration.FactZeroOffset4	6135… 6136	9068	Float	RO	zero correction value comp2 determined in factory
Status.Calibration.PumpControl	3044	3044	Word	RO	internal pump is controlled by 0=PumpState, 1=dig.input
Status.Calibration.PumpState	2033	2033	Boolean	RO	state of built-in pump
Status.Calibration.ZeroOffset1	6109… 6110	9055	Float	RO	offset for comp1 determined by zero calibration
Status.Calibration.ZeroOffset2	6111… 6112	9056	Float	RO	offset for comp2 determined by zero calibration
Status.Calibration.ZeroOffset3	6113… 6114	9057	Float	RO	offset for comp3 determined by zero calibration
Status.Calibration.ZeroOffset4	6115… 6116	9058	Float	RO	offset for comp4 determined by zero calibration
Status.ChannelState.ChannelState1	5011… 5012	8006	DWord	RO	component1‘s state bitfield (b0:......)
Status.ChannelState.ChannelState2	5013… 5014	8007	DWord	RO	component2‘s state bitfield (b0:......)
Status.ChannelState.ChannelState3	5015… 5016	8008	DWord	RO	component3‘s state bitfield (b0:......)
Status.ChannelState.ChannelState4	5017… 5018	8009	DWord	RO	component4‘s state bitfield (b0:......)
Status.DeviceState	5009… 5010	8005	DWord	RO	device‘s state bit-field
Status.DIO.InputState1	4008	4008	Word	RO	Input state of a Digital Input Card #1
Status.DIO.InputState2	4009	4009	Word	RO	Input state of a Digital Input Card #2
Status.DIO.OutputState1	4006	4006	Word	RO	Output state of a XDIO Card #1
Status.DIO.OutputState2	4007	4007	Word	RO	Output state of a XDIO Card #2
Status.DIO.PSAOutputState	4002	4002	Word	RO	DOut state of a PSA Card

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Status.DIO.PSASHSState	4031	4031	Word	RO	state of a PSA Card's SHS
Status.Flow1	6193… 6194	9097	Float	RO	flow component1 in l/min
Status.Flow2	6195… 6196	9098	Float	RO	flow component2 in l/min
Status.Flow3	6197… 6198	9099	Float	RO	flow component3 in l/min
Status.Flow4	6199… 6200	9100	Float	RO	flow component4 in l/min
Status.Meas.FlowSensor1	6021… 6022	9011	Float	RO	calculated flow of sensor1 in l/min
Status.Meas.FlowSensor2	6023… 6024	9012	Float	RO	calculated flow of sensor2 in l/min
Status.Meas.FlowSensor3	6025… 6026	9013	Float	RO	calculated flow of sensor3 in l/min
Status.Meas.FlowSensor4	6027… 6028	9014	Float	RO	calculated flow of sensor4 in l/min
Status.Meas.RawMeasConcentration1	6009… 6010	9005	Float	RO	raw ADC of measure-side component1
Status.Meas.RawMeasConcentration2	6011… 6012	9006	Float	RO	raw ADC of measure-side component2
Status.Meas.RawMeasConcentration3	6013… 6014	9007	Float	RO	raw ADC of measure-side component3
Status.Meas.RawMeasConcentration4	6015… 6016	9008	Float	RO	raw ADC of measure-side component4
Status.Meas.RawQuotConce1	6053… 6054	9027	Float	RO	raw ADC quotient of component1
Status.Meas.RawQuotConce2	6055… 6056	9028	Float	RO	raw ADC quotient of component2
Status.Meas.RawQuotConce3	6057… 6058	9029	Float	RO	raw ADC quotient of component3
Status.Meas.RawQuotConce4	6059… 6060	9030	Float	RO	raw ADC quotient of component4
Status.Meas.RawRefConce1	6045… 6046	9023	Float	RO	raw ADC of reference side component1
Status.Meas.RawRefConce2	6047… 6048	9024	Float	RO	raw ADC of reference side component2
Status.Meas.RawRefConce3	6049… 6050	9025	Float	RO	raw ADC of reference side component3
Status.Meas.RawRefConce4	6051… 6052	9026	Float	RO	raw ADC of reference side component4
Status.Meas.SourceCurrent1	6037… 6038	9019	Float	RO	source current of component 1 in mA

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Status.Meas.SourceCurrent2	6039… 6040	9020	Float	RO	source current of component 2 in mA
Status.Meas.SourceCurrent3	6041… 6042	9021	Float	RO	source current of component 3 in mA
Status.Meas.SourceCurrent4	6043… 6044	9022	Float	RO	source current of component 4 in mA
Status.Meas.TempSensor1	6029… 6030	9015	Float	RO	calculated temperature 1 in °C
Status.Meas.TempSensor2	6031… 6032	9016	Float	RO	calculated temperature 2 in °C
Status.Meas.TempSensor3	6033… 6034	9017	Float	RO	calculated temperature 3 in °C
Status.Meas.TempSensor4	6035… 6036	9018	Float	RO	calculated temperature 4 in °C
Status.NamurState	4001	4001	Word	RO	device‘s NAMUR state bit-field (b0:F, b1:M, b2:O, b3:C)
Status.NamurStates.NamurFailure	5001… 5002	8001	DWord	RO	Namur Failure bitfield
Status.NamurStates.NamurFctCheck	5007… 5008	8004	DWord	RO	Namur Function Check bitfield
Status.NamurStates.NamurMaint	5003… 5004	8002	DWord	RO	Namur Maintenance Request bitfield
Status.NamurStates.NamurOffSpec	5005… 5006	8003	DWord	RO	Namur Off Specification bitfield
Status.Pressure	6017… 6018	9009	Float	RO	Air Pressure
Status.PV1	6001… 6002	9001	Float	RO	Concentration of component1 (in ppm)
Status.PV1_Dis	6209… 6210	9105	Float	RO	Concentration of comp1 (in unit of display)
Status.PV2	6003… 6004	9002	Float	RO	Concentration of component2 (in ppm)
Status.PV2_Dis	6211… 6212	9106	Float	RO	Concentration of comp2 (in unit of display)
Status.PV3	6005… 6006	9003	Float	RO	Concentration of component3 (in ppm)
Status.PV3_Dis	6213… 6214	9107	Float	RO	Concentration of comp3 (in unit of display)
Status.PV4	6007… 6008	9004	Float	RO	Concentration of component4 (in ppm)
Status.PV4_Dis	6215… 6216	9108	Float	RO	Concentration of comp4 (in unit of display)

9.3 List of Parameters and Registers - Sorted by Tag Name

Tag Name	Address		Data Type	Client Access	Description
	Modicon	Daniel			
Status.Temperature1	6185… 6186	9093	Float	RO	calculated temperature 1 in °C
Status.Temperature2	6187… 6188	9094	Float	RO	calculated temperature 2 in °C
Status.Temperature3	6189… 6190	9095	Float	RO	calculated temperature 3 in °C
Status.Temperature4	6191… 6192	9096	Float	RO	calculated temperature 4 in °C
Status.ZoomState1	3257	3257	Word	RO	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
Status.ZoomState2	3258	3258	Word	RO	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
Status.ZoomState3	3259	3259	Word	RO	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
Status.ZoomState4	3260	3260	Word	RO	ZoomStatus AOut4 (0=Normal, 1=Zoomed)

9.4 List Of Parameters And Registers - Sorted By Daniel Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
2001	2001	Control.Calibration.Zero_1	Boolean	R/W	Zero calibration comp1 (1=start)
2002	2002	Control.Calibration.Zero_2	Boolean	R/W	Zero calibration comp2 (1=start)
2003	2003	Control.Calibration.Zero_3	Boolean	R/W	Zero calibration comp3 (1=start)
2004	2004	Control.Calibration.Zero_4	Boolean	R/W	Zero calibration comp4 (1=start)
2005	2005	Control.Calibration.Zero_All	Boolean	R/W	Zero calibration all (1=start)
2006	2006	Control.Calibration.Span_1	Boolean	R/W	Span calibration comp1 (1=start)
2007	2007	Control.Calibration.Span_2	Boolean	R/W	Span calibration comp2 (1=start)
2008	2008	Control.Calibration.Span_3	Boolean	R/W	Span calibration comp3 (1=start)
2009	2009	Control.Calibration.Span_4	Boolean	R/W	Span calibration comp4 (1=start)
2010	2010	Control.Calibration.Span_All	Boolean	R/W	Span calibration all (1=start)
2011	2011	Control.Calibration.ZeroSpan_All	Boolean	R/W	Zero + span calibration all (1=start)
2012	2012	Control.Calibration.Calibration_ Cancel	Boolean	R/W	Cancel any calibration (1=cancel)
2013	2013	Setup.Calibration.RestoreCalibZe-ro1	Boolean	R/W	restore zero calibration parameters from user memory for comp1
2014	2014	Setup.Calibration.RestoreCalibZe-ro2	Boolean	R/W	restore zero calibration parameters from user memory for comp2
2015	2015	Setup.Calibration.RestoreCalibZe-ro3	Boolean	R/W	restore zero calibration parameters from user memory for comp3
2016	2016	Setup.Calibration.RestoreCalibZe-ro4	Boolean	R/W	restore zero calibration parameters from user memory for comp4
2017	2017	Setup.Calibration.RestoreCalib-Span1	Boolean	R/W	restore span calibration parameters from user memory for comp1
2018	2018	Setup.Calibration.RestoreCalib-Span2	Boolean	R/W	restore span calibration parameters from user memory for comp2
2019	2019	Setup.Calibration.RestoreCalib-Span3	Boolean	R/W	restore span calibration parameters from user memory for comp3
2020	2020	Setup.Calibration.RestoreCalib-Span4	Boolean	R/W	restore span calibration parameters from user memory for comp4
2021	2021	Control.ApplyGas.SampleValve	Boolean	R/W	0=close all valves, 1=open sample valve
2025	2025	Control.ApplyGas.ZeroValve1	Boolean	R/W	0=open sample valve, 1=open zero valve comp1
2026	2026	Control.ApplyGas.ZeroValve2	Boolean	R/W	0=open sample valve, 1=open zero valve comp2
2027	2027	Control.ApplyGas.ZeroValve3	Boolean	R/W	0=open sample valve, 1=open zero valve comp3
2028	2028	Control.ApplyGas.ZeroValve4	Boolean	R/W	0=open sample valve, 1=open zero valve comp4
2029	2029	Control.ApplyGas.SpanValve1	Boolean	R/W	0=open sample valve, 1=open span valve comp1
2030	2030	Control.ApplyGas.SpanValve2	Boolean	R/W	0=open sample valve, 1=open span valve comp2
2031	2031	Control.ApplyGas.SpanValve3	Boolean	R/W	0=open sample valve, 1=open span valve comp3
2032	2032	Control.ApplyGas.SpanValve4	Boolean	R/W	0=open sample valve, 1=open span valve comp4

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
2033	2033	Control.ApplyGas.PumpState	Boolean	R/W	0=Off, 1=On
2033	2033	Status.Calibration.PumpState	Boolean	RO	state of built-in pump
2037	2037	Control.ResetDevice	Boolean	R/W	reset the device: 0=none, 1=reset
2038	2038	Control.AcknowledgeStates	Boolean	R/W	1=Acknowledge device‘s states, 0=no effect
2039	2039	Control.RemoteExclusive	Boolean	R/W	Device access mode (0=Remote&LOI, 1=Remo-teOnly)
3001	3001	Service.General.NumberChannels	Word	R/W	number of built-in component channels
3002	3002	Service.General.WarmupTime	Word	R/W	time in secs that is used for warmup phase
3003	3003	Setup.Measurement.Response-Time1	Word	R/W	signal damping (in secs) for gas change of comp1
3004	3004	Setup.Measurement.Response-Time2	Word	R/W	signal damping (in secs) for gas change of comp2
3005	3005	Setup.Measurement.Response-Time3	Word	R/W	signal damping (in secs) for gas change of comp3
3006	3006	Setup.Measurement.Response-Time4	Word	R/W	signal damping (in secs) for gas change of comp4
3007	3007	Service.Linearizer.Unlinear	Word	R/W	activates unlinear concentration measurement (0 = no, 1 = yes)
3008	3008	Service.RemoteSecurity	Word	R/W	Input Code to enable service accesss
3011	3011	Service.Measurement.MaxConce-Percent1	Word	R/W	max. allowed values in % of range for cal gases and conc limits
3012	3012	Service.Measurement.MaxConce-Percent2	Word	R/W	max. allowed values in % of range for cal gases and conc limits
3013	3013	Service.Measurement.MaxConce-Percent3	Word	R/W	max. allowed values in % of range for cal gases and conc limits
3014	3014	Service.Measurement.MaxConce-Percent4	Word	R/W	max. allowed values in % of range for cal gases and conc limits
3015	3015	Service.Measurement.Difference-Measurement	Word	R/W	bitfield to enable difference mode (b0=Ch1, b1=Ch2 etc.)
3016	3016	Setup.In/Outputs.AnalogOut.AOutType	Word	R/W	AOut behavior (0=0_20,1=4_20,2=0_20L,3=4_20 L,4=0_20H,5=4_20H)
3017	3017	Setup.In/Outputs.AnalogOut.AOut-SignalAssign1	Word	R/W	asgn AOut1(0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
3018	3018	Setup.In/Outputs.AnalogOut.AOut-SignalAssign2	Word	R/W	asgn AOut2 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
3019	3019	Setup.In/Outputs.AnalogOut.AOut-SignalAssign3	Word	R/W	asgn AOut3 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
3020	3020	Setup.In/Outputs.AnalogOut.AOut-SignalAssign4	Word	R/W	asgn AOut4 (0=std,1=AdjStart,2=AdjEnd, 3=Rng-C2)
3021	3021	Setup.Calibration.ToleranceCheck	Word	R/W	check deviation tolerance (0=Off,1=On/AutoClear,2=On)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3023	3023	Info.InstalledOptions.FlowAlarmIn-stalled	Word	RO	digital flow alarm installed
3023	3023	Service.InstalledOptions.FlowAlar-mInstalled	Word	R/W	digital flow alarm installed
3024	3024	Service.InstalledOptions. AOutNumber	Word	R/W	number of installed analog outputs
3025	3025	Info.InstalledOptions.SIntInstalled	Word	RO	serial interface hardware installed
3025	3025	Service.InstalledOptions.SIntIn-stalled	Word	R/W	serial interface hardware installed
3026	3026	Setup.Communication.SIntModbus-Ft32	Word	R/W	32bit regs format (0=Daniel, 1=Modicon, 2=Modi-con swap)
3027	3027	Info.InstalledOptions.PressureSen-sorInstalled	Word	RO	pressure (0=manual,1=intSens,2=cyclRemote,3= comp2)
3027	3027	Service.InstalledOptions.Pressure-SensorInstalled	Word	R/W	pressure (0=manual,1=intSens,2=cyclRemote)
3028	3028	Service.Communication.SvcMod-busFt32	Word	R/W	Svc: 32bit regs format (0=Daniel, 1=Modicon, 2=Modicon swap)
3030	3030	Info.InstalledOptions.DIO_Installed	Word	RO	dig. IO installed: 0=None, 1=Card1, 2=Card1+2
3030	3030	Service.InstalledOptions.DIO_In-stalled	Word	R/W	dig. IO installed: 0=None, 1=Card1, 2=Card1+2
3031	3031	Info.InstalledOptions.ValvesIn-stalled	Word	RO	kind of valve unit installed (0=No,1=int.,2=ext.,3= int.&ext.)
3031	3031	Service.InstalledOptions.ValvesIn-stalled	Word	R/W	kind of valve unit installed (0=No,1=int.,2=ext.,3= int.&ext.)
3032	3032	Setup.Calibration.Valves.ZeroVal-veAssign1	Word	R/W	assigns zero gas of comp1 to valves
3033	3033	Setup.Calibration.Valves.ZeroVal-veAssign2	Word	R/W	assigns zero gas of comp2 to valves
3034	3034	Setup.Calibration.Valves.ZeroVal-veAssign3	Word	R/W	assigns zero gas of comp3 to valves
3035	3035	Setup.Calibration.Valves.ZeroVal-veAssign4	Word	R/W	assigns zero gas of comp4 to valves
3036	3036	Setup.Calibration.Valves.SpanVal-veAssign1	Word	R/W	assigns span gas of comp1 to valves
3037	3037	Setup.Calibration.Valves.SpanVal-veAssign2	Word	R/W	assigns span gas of comp2 to valves
3038	3038	Setup.Calibration.Valves.SpanVal-veAssign3	Word	R/W	assigns span gas of comp3 to valves
3039	3039	Setup.Calibration.Valves.SpanVal-veAssign4	Word	R/W	assigns span gas of comp4 to valves
3041	3041	Setup.Calibration.FlushingPeriod	Word	R/W	purge delay time (in secs) for gas supply

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3042	3042	Setup.Calibration.HoldStatus	Word	R/W	hold analog outputs and alarms during non sample gas flowing
3043	3043	Info.InstalledOptions.PumpInstalled	Word	RO	pump is installed and controlled by device
3043	3043	Service.InstalledOptions.PumpInstalled	Word	R/W	pump is installed and controlled by device
3044	3044	Status.Calibration.PumpControl	Word	RO	internal pump is controlled by 0=PumpState, 1=dig.input
3047	3047	Setup.In/Outputs.DigitalInOut.PSAOut.Relais1	Word	R/W	signal assigned to relais1 of PSA-board
3048	3048	Setup.In/Outputs.DigitalInOut.PSAOut.Relais2	Word	R/W	signal assigned to relais2 of PSA-board
3049	3049	Setup.In/Outputs.DigitalInOut.PSAOut.Relais3	Word	R/W	signal assigned to relais3 of PSA-board
3050	3050	Setup.In/Outputs.DigitalInOut.PSAOut.Relais4	Word	R/W	signal assigned to relais4 of PSA-board
3051	3051	Setup.In/Outputs.DigitalInOut.PSASHS.Valve1	Word	R/W	signal assigned to valve1 of PSA-board
3052	3052	Setup.In/Outputs.DigitalInOut.PSASHS.Valve2	Word	R/W	signal assigned to valve2 of PSA-board
3053	3053	Setup.In/Outputs.DigitalInOut.PSASHS.Valve3	Word	R/W	signal assigned to valve3 of PSA-board
3054	3054	Setup.In/Outputs.DigitalInOut.PSASHS.Valve4	Word	R/W	signal assigned to valve4 of PSA-board
3055	3055	Setup.In/Outputs.DigitalInOut.PSASHS.Valve5	Word	R/W	signal assigned to valve5 of PSA-board
3056	3056	Setup.In/Outputs.DigitalInOut.PSASHS.Valve6	Word	R/W	signal assigned to valve6 of PSA-board
3057	3057	Setup.In/Outputs.DigitalInOut.PSASHS.Valve7	Word	R/W	signal assigned to valve7 of PSA-board
3058	3058	Setup.In/Outputs.DigitalInOut.PSASHS.Valve8	Word	R/W	signal assigned to valve8 of PSA-board
3059	3059	Setup.In/Outputs.DigitalInOut.PSASHS.Pump1	Word	R/W	signal assigned to pump1 of PSA-board
3060	3060	Setup.In/Outputs.DigitalInOut.PSASHS.Pump2	Word	R/W	signal assigned to pump2 of PSA-board
3061	3061	Setup.In/Outputs.DigitalInOut.DIO1Out.Out1	Word	R/W	signal assigned to Output1 of DIO-board#1
3062	3062	Setup.In/Outputs.DigitalInOut.DIO1Out.Out2	Word	R/W	signal assigned to Output2 of DIO-board#1
3063	3063	Setup.In/Outputs.DigitalInOut.DIO1Out.Out3	Word	R/W	signal assigned to Output3 of DIO-board#1

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3064	3064	Setup.In/Outputs.DigitalInOut.DIO1Out.Out4	Word	R/W	signal assigned to Output4 of DIO-board#1
3065	3065	Setup.In/Outputs.DigitalInOut.DIO1Out.Out5	Word	R/W	signal assigned to Output5 of DIO-board#1
3066	3066	Setup.In/Outputs.DigitalInOut.DIO1Out.Out6	Word	R/W	signal assigned to Output6 of DIO-board#1
3067	3067	Setup.In/Outputs.DigitalInOut.DIO1Out.Out7	Word	R/W	signal assigned to Output7 of DIO-board#1
3068	3068	Setup.In/Outputs.DigitalInOut.DIO1Out.Out8	Word	R/W	signal assigned to Output8 of DIO-board#1
3069	3069	Setup.In/Outputs.DigitalInOut.DIO1Out.Out9	Word	R/W	signal assigned to Output9 of DIO-board#1
3071	3071	Setup.In/Outputs.DigitalInOut.DIO2Out.Out1	Word	R/W	signal assigned to Output1 of DIO-board#2
3072	3072	Setup.In/Outputs.DigitalInOut.DIO2Out.Out2	Word	R/W	signal assigned to Output2 of DIO-board#2
3073	3073	Setup.In/Outputs.DigitalInOut.DIO2Out.Out3	Word	R/W	signal assigned to Output3 of DIO-board#2
3074	3074	Setup.In/Outputs.DigitalInOut.DIO2Out.Out4	Word	R/W	signal assigned to Output4 of DIO-board#2
3075	3075	Setup.In/Outputs.DigitalInOut.DIO2Out.Out5	Word	R/W	signal assigned to Output5 of DIO-board#2
3076	3076	Setup.In/Outputs.DigitalInOut.DIO2Out.Out6	Word	R/W	signal assigned to Output6 of DIO-board#2
3077	3077	Setup.In/Outputs.DigitalInOut.DIO2Out.Out7	Word	R/W	signal assigned to Output7 of DIO-board#2
3078	3078	Setup.In/Outputs.DigitalInOut.DIO2Out.Out8	Word	R/W	signal assigned to Output8 of DIO-board#2
3079	3079	Setup.In/Outputs.DigitalInOut.DIO2Out.Out9	Word	R/W	signal assigned to Output9 of DIO-board#2
3081	3081	Setup.In/Outputs.DigitalInOut.DIO1In.Input1	Word	R/W	signal assigned to Input1 of DIO-board#1
3082	3082	Setup.In/Outputs.DigitalInOut.DIO1In.Input2	Word	R/W	signal assigned to Input2 of DIO-board#1
3083	3083	Setup.In/Outputs.DigitalInOut.DIO1In.Input3	Word	R/W	signal assigned to Input3 of DIO-board#1
3084	3084	Setup.In/Outputs.DigitalInOut.DIO1In.Input4	Word	R/W	signal assigned to Input4 of DIO-board#1
3085	3085	Setup.In/Outputs.DigitalInOut.DIO1In.Input5	Word	R/W	signal assigned to Input5 of DIO-board#1
3086	3086	Setup.In/Outputs.DigitalInOut.DIO1In.Input6	Word	R/W	signal assigned to Input6 of DIO-board#1

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3087	3087	Setup.In/Outputs.DigitalInOut. DIO1In.Input7	Word	R/W	signal assigned to Input7 of DIO-board#1
3088	3088	Setup.In/Outputs.DigitalInOut. DIO2In.Input1	Word	R/W	signal assigned to Input1 of DIO-board#2
3089	3089	Setup.In/Outputs.DigitalInOut. DIO2In.Input2	Word	R/W	signal assigned to Input2 of DIO-board#2
3090	3090	Setup.In/Outputs.DigitalInOut. DIO2In.Input3	Word	R/W	signal assigned to Input3 of DIO-board#2
3091	3091	Setup.In/Outputs.DigitalInOut. DIO2In.Input4	Word	R/W	signal assigned to Input4 of DIO-board#2
3092	3092	Setup.In/Outputs.DigitalInOut. DIO2In.Input5	Word	R/W	signal assigned to Input5 of DIO-board#2
3093	3093	Setup.In/Outputs.DigitalInOut. DIO2In.Input6	Word	R/W	signal assigned to Input6 of DIO-board#2
3094	3094	Setup.In/Outputs.DigitalInOut. DIO2In.Input7	Word	R/W	signal assigned to Input7 of DIO-board#2
3095	3095	Setup.Calibration.Auto.AutoZero-TimeInterval	Word	R/W	time interval in hours for automatic zero calibra-tions
3096	3096	Setup.Calibration.Auto.AutoZero-StartHours	Word	R/W	hour part for next start of automatic zero calibra-tion
3096	3096	Status.Calibration.AutoZeroStart-Hours	Word	RO	hour part for next start of automatic zero calibra-tion
3097	3097	Setup.Calibration.Auto.AutoZero-StartMinutes	Word	R/W	minute part for next start of automatic zero calibra-tion
3097	3097	Status.Calibration.AutoZeroStart-Minutes	Word	RO	minute part for next start of automatic zero calibra-tion
3098	3098	Setup.Calibration.Auto.AutoZero-SpanTimeInterval	Word	R/W	time interval in hours for automatic zero&span calibrations
3099	3099	Setup.Calibration.Auto.AutoZSpan-StartHours	Word	R/W	hour part for next start of automatic zero&span calibrations
3099	3099	Status.Calibration.AutoZSpanStart-Hours	Word	RO	hour part for next start of automatic zero&span calibrations
3100	3100	Setup.Calibration.Auto.AutoZSpan-StartMinutes	Word	R/W	minute part for next start of automatic zero&span calibrations
3100	3100	Status.Calibration.AutoZSpanStart-Minutes	Word	RO	minute part for next start of automatic zero&span calibrations
3101	3101	Setup.Alarms.Limit1AlarmTyp1	Word	R/W	alarm type limit1 comp1: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3102	3102	Setup.Alarms.Limit1AlarmTyp2	Word	R/W	alarm type limit1 comp2: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3103	3103	Setup.Alarms.Limit1AlarmTyp3	Word	R/W	alarm type limit1 comp3: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3104	3104	Setup.Alarms.Limit1AlarmTyp4	Word	R/W	alarm type limit1 comp4: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3105	3105	Setup.Alarms.Limit2AlarmTyp1	Word	R/W	alarm type limit2 comp1: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3106	3106	Setup.Alarms.Limit2AlarmTyp2	Word	R/W	alarm type limit2 comp2: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3107	3107	Setup.Alarms.Limit2AlarmTyp3	Word	R/W	alarm type limit2 comp3: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3108	3108	Setup.Alarms.Limit2AlarmTyp4	Word	R/W	alarm type limit2 comp4: 0=off 1=lo 2=hi 3=offFS 4=loFS 5=hiFS
3109	3109	Service.TempControl.TempCheckEnable1	Word	R/W	check of comp1 for correct temperature: 0=Off 1=Temp1 2=Temp2
3110	3110	Service.TempControl.TempCheckEnable2	Word	R/W	check of comp2 for correct temperature: 0=Off 1=Temp1 2=Temp2
3111	3111	Service.TempControl.TempCheckEnable3	Word	R/W	check of comp3 for correct temperature: 0=Off 1=Temp1 2=Temp2
3112	3112	Service.TempControl.TempCheckEnable4	Word	R/W	check of comp4 for correct temperature: 0=Off 1=Temp1 2=Temp2
3113	3113	Service.TempControl.TempLowLimit1	Word	R/W	low limit in °C for temperature check of comp1
3114	3114	Service.TempControl.TempLowLimit2	Word	R/W	low limit in °C for temperature check of comp2
3115	3115	Service.TempControl.TempLowLimit3	Word	R/W	low limit in °C for temperature check of comp3
3116	3116	Service.TempControl.TempLowLimit4	Word	R/W	low limit in °C for temperature check of comp4
3117	3117	Service.TempControl.TempHighLimit1	Word	R/W	high limit in °C for temperature check of comp1
3118	3118	Service.TempControl.TempHighLimit2	Word	R/W	high limit in °C for temperature check of comp2
3119	3119	Service.TempControl.TempHighLimit3	Word	R/W	high limit in °C for temperature check of comp3
3120	3120	Service.TempControl.TempHighLimit4	Word	R/W	high limit in °C for temperature check of comp4
3121… 3124	3121… 3124	Setup.Display.Component.PrimVariableName1	String	R/W	displayed tag for component1
3125… 3127	3125… 3127	Setup.Display.Component.PrimVariableUnit1	String	R/W	unit displayed for comp1
3128	3128	Setup.Display.Component.DecimalPoint1	Word	R/W	decimal points displayed for component1
3129	3129	Setup.Display.SecVars.TempUnit	Word	R/W	unit to display temperatures (0=°C, 1=°F)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3130	3130	Setup.Display.SecVars.TempDecimalPoint	Word	R/W	decimal point position for temperature displays
3131… 3134	3131… 3134	Setup.Display.Component.PrimVariableName2	String	R/W	displayed tag for component2
3135… 3137	3135… 3137	Setup.Display.Component.PrimVariableUnit2	String	R/W	unit displayed for comp2
3138	3138	Setup.Display.Component.DecimalPoint2	Word	R/W	decimal points displayed for component2
3139	3139	Setup.Display.SecVars.PressUnit	Word	R/W	unit to display pressures (0=Pa,1=hPa,2=mbar,3=Bar,4=psig)
3140	3140	Setup.Display.SecVars.PresDecimalPoint	Word	R/W	decimal point position for pressure displays
3141… 3144	3141… 3144	Setup.Display.Component.PrimVariableName3	String	R/W	displayed tag for component3
3145… 3147	3145… 3147	Setup.Display.Component.PrimVariableUnit3	String	R/W	unit displayed for comp3
3148	3148	Setup.Display.Component.DecimalPoint3	Word	R/W	decimal points displayed for component3
3149	3149	Setup.Display.SecVars.FlowUnit	Word	R/W	unit to display flows (0=??, 1=??)
3150	3150	Setup.Display.SecVars.FlowDecimalPoint	Word	R/W	decimal point position for flow displays
3151… 3154	3151… 3154	Setup.Display.Component.PrimVariableName4	String	R/W	displayed tag for component4
3155… 3157	3155… 3157	Setup.Display.Component.PrimVariableUnit4	String	R/W	unit displayed for comp4
3158	3158	Setup.Display.Component.DecimalPoint4	Word	R/W	decimal points displayed for component4
3159	3159	Setup.SaveLoadUpdate.ConfigSaveLoad	Word	R/W	load/save memory: 0=load user, 1=load factory, 2=save user
3161	3161	Service.LOI.HideOptionLines	Word	R/W	hides menu lines if depending on installed options: 0=Off 1=On
3162	3162	Setup.Display.Language	Word	R/W	LOI‘s language (0=EN, 1=DE, 2=3rd language)
3163	3163	Setup.Display.LOIAutoHome	Word	R/W	Auto ‚Home‘ for LOI (0=Never, 1=1minute, 2=10minutes)
3164	3164	Service.LOI.KeyDebounceCount	Word	R/W	number of key scans for validating
3165	3165	Setup.Display.Lang3Name	String	R/W	LOI‘s 3rd language (according ISO 639-1)
3166	3166	Setup.Display.MeasureLines.MeasLine1	Word	R/W	signal assigned to line1 of 1st measurement display(0..n)
3167	3167	Setup.Display.MeasureLines.MeasLine2	Word	R/W	signal assigned to line2 of 1st measurement display(0..n)
3168	3168	Setup.Display.MeasureLines.MeasLine3	Word	R/W	signal assigned to line3 of 1st measurement display(0..n)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3169	3169	Setup.Display.MeasureLines.MeasLine4	Word	R/W	signal assigned to line4 of 1st measurement display(0..n)
3170	3170	Setup.Display.MenuAccesss.Auto-CodeMode	Word	R/W	defines how codes autom. locked (0=never,1=home,2=1minute)
3171…3174	3171…3174	Setup.Display.MenuAccesss.Basi-cAccessCode	String	R/W	user code for getting access to basic areas
3175	3175	Setup.Display.MenuAccesss.Basi-cAccMode	Word	R/W	mode for access to basic areas (0=allowed,1=code, 2=prohibited)
3176…3179	3176…3179	Setup.Display.MenuAccesss.Exper-tAccessCode	String	R/W	user code for getting access to expert areas
3180	3180	Setup.Display.MenuAccesss.Exper-tAccMode	Word	R/W	mode for access to expert areas (0=allowed,1=co de,2=prohibited)
3181…3184	3181…3184	Setup.Display.MenuAccesss.Spe-cialAccessCode	String	R/W	user code for getting access to special areas
3185	3185	Setup.Display.MenuAccesss.Spe-cialAccMode	Word	R/W	mode for access special areas (0=allowed,1=code ,2=prohibited)
3186…3189	3186…3189	Service.General.EmersonAccCode	String	R/W	code for getting LOI access to Emerson areas
3190	3190	Service.General.EmersonAccMode	Word	RO	mode for getting LOI access to Emerson areas
3191	3191	Service.Measurement.Simulation	Word	R/W	bitfield for enabling simulation of single compon-ents
3192	3192	Service.Measurement.StartRaw-Meas1	Word	R/W	start raw measurement of component1
3193	3193	Service.Measurement.StartRaw-Meas2	Word	R/W	start raw measurement of component2
3194	3194	Service.Measurement.StartRaw-Meas3	Word	R/W	start raw measurement of component3
3195	3195	Service.Measurement.StartRaw-Meas4	Word	R/W	start raw measurement of component4
3196…3200	3196…3200	Info.SerialNumber	String	RO	serial number of the device
3196…3200	3196…3200	Service.General.SerialNumber	String	R/W	serial number of the device
3201…3210	3201…3210	Info.ChannelId1	String	RO	channel identification text of comp1
3201…3210	3201…3210	Service.General.ChannelId1	String	R/W	channel identification text of comp1
3211…3220	3211…3220	Info.ChannelId2	String	RO	channel identification text of comp2
3211…3220	3211…3220	Service.General.ChannelId2	String	R/W	channel identification text of comp2

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3221… 3230	3221… 3230	Info.ChannelId3	String	RO	channel identification text of comp3
3221… 3230	3221… 3230	Service.General.ChannelId3	String	R/W	channel identification text of comp3
3231… 3240	3231… 3240	Info.ChannelId4	String	RO	channel identification text of comp4
3231… 3240	3231… 3240	Service.General.ChannelId4	String	R/W	channel identification text of comp4
3241… 3256	3241… 3256	Info.ProgramVersion	String	RO	software release version
3257	3257	Control.AnalogOut.ZoomState1	Word	R/W	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
3257	3257	Setup.In/Outputs.AnalogOut.Zoom-State1	Word	R/W	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
3257	3257	Status.ZoomState1	Word	RO	ZoomStatus AOut1 (0=Normal, 1=Zoomed)
3258	3258	Control.AnalogOut.ZoomState2	Word	R/W	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
3258	3258	Setup.In/Outputs.AnalogOut.Zoom-State2	Word	R/W	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
3258	3258	Status.ZoomState2	Word	RO	ZoomStatus AOut2 (0=Normal, 1=Zoomed)
3259	3259	Control.AnalogOut.ZoomState3	Word	R/W	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
3259	3259	Setup.In/Outputs.AnalogOut.Zoom-State3	Word	R/W	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
3259	3259	Status.ZoomState3	Word	RO	ZoomStatus AOut3 (0=Normal, 1=Zoomed)
3260	3260	Control.AnalogOut.ZoomState4	Word	R/W	ZoomStatus AOut4 (0=Normal, 1=Zoomed)
3260	3260	Setup.In/Outputs.AnalogOut.Zoom-State4	Word	R/W	ZoomStatus AOut4 (0=Normal, 1=Zoomed)
3260	3260	Status.ZoomState4	Word	RO	ZoomStatus AOut4 (0=Normal, 1=Zoomed)
3261	3261	Setup.In/Outputs.AnalogOut. Zoom1	Word	R/W	Zoom AOut1 (in %)
3262	3262	Setup.In/Outputs.AnalogOut. Zoom2	Word	R/W	Zoom AOut2 (in %)
3263	3263	Setup.In/Outputs.AnalogOut. Zoom3	Word	R/W	Zoom AOut3 (in %)
3264	3264	Setup.In/Outputs.AnalogOut. Zoom4	Word	R/W	Zoom AOut4 (in %)
3265	3265	Setup.In/Outputs.AnalogOut.Zoom-Control1	Word	R/W	ZoomControl of AOut1 (0=Manual, 1=DigInput, 2=Auto)
3266	3266	Setup.In/Outputs.AnalogOut.Zoom-Control2	Word	R/W	ZoomControl of AOut2 (0=Manual, 1=DigInput, 2=Auto)
3267	3267	Setup.In/Outputs.AnalogOut.Zoom-Control3	Word	R/W	ZoomControl of AOut3 (0=Manual, 1=DigInput, 2=Auto)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3268	3268	Setup.In/Outputs.AnalogOut.Zoom-Control4	Word	R/W	ZoomControl of AOut4 (0=Manual, 1=DigInput, 2=Auto)
3269	3269	Setup.In/Outputs.AnalogOut.Zoom-Posit1	Word	R/W	ZoomPosition AOut1 (0=LowScale, 1=HighScale)
3270	3270	Setup.In/Outputs.AnalogOut.Zoom-Posit2	Word	R/W	ZoomPosition AOut2 (0=LowScale, 1=HighScale)
3271	3271	Setup.In/Outputs.AnalogOut.Zoom-Posit3	Word	R/W	ZoomPosition AOut3 (0=LowScale, 1=HighScale)
3272	3272	Setup.In/Outputs.AnalogOut.Zoom-Posit4	Word	R/W	ZoomPosition AOut4 (0=LowScale, 1=HighScale)
3273	3273	Info.InstalledOptions.FlowSenso-rAssigned1	Word	RO	flow sensor assigned to comp1 (0=None, etc.)
3273	3273	Service.InstalledOptions.FlowSen-sorAssigned1	Word	R/W	flow sensor assigned to comp1 (0=None, etc.)
3274	3274	Info.InstalledOptions.FlowSenso-rAssigned2	Word	RO	flow sensor assigned to comp2 (0=None, etc.)
3274	3274	Service.InstalledOptions.FlowSen-sorAssigned2	Word	R/W	flow sensor assigned to comp2 (0=None, etc.)
3275	3275	Info.InstalledOptions.FlowSenso-rAssigned3	Word	RO	flow sensor assigned to comp3 (0=None, etc.)
3275	3275	Service.InstalledOptions.FlowSen-sorAssigned3	Word	R/W	flow sensor assigned to comp3 (0=None, etc.)
3276	3276	Info.InstalledOptions.FlowSenso-rAssigned4	Word	RO	flow sensor assigned to comp4 (0=None, etc.)
3276	3276	Service.InstalledOptions.FlowSen-sorAssigned4	Word	R/W	flow sensor assigned to comp4 (0=None, etc.)
3277	3277	Info.InstalledOptions.TempSenso-rAssigned1	Word	RO	temp sensor assigned to comp1 (0=None, etc.)
3277	3277	Service.InstalledOptions.TempSen-sorAssigned1	Word	R/W	temp sensor assigned to comp1 (0=None, etc.)
3278	3278	Info.InstalledOptions.TempSenso-rAssigned2	Word	RO	temp sensor assigned to comp2 (0=None, etc.)
3278	3278	Service.InstalledOptions.TempSen-sorAssigned2	Word	R/W	temp sensor assigned to comp2 (0=None, etc.)
3279	3279	Info.InstalledOptions.TempSenso-rAssigned3	Word	RO	temp sensor assigned to comp3 (0=None, etc.)
3279	3279	Service.InstalledOptions.TempSen-sorAssigned3	Word	R/W	temp sensor assigned to comp3 (0=None, etc.)
3280	3280	Info.InstalledOptions.TempSenso-rAssigned4	Word	RO	temp sensor assigned to comp4 (0=None, etc.)
3280	3280	Service.InstalledOptions.TempSen-sorAssigned4	Word	R/W	temp sensor assigned to comp4 (0=None, etc.)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
3281… 3296	3281… 3296	Info.ManufacturingInfo	String	RO	Infos stored for manufacturing purposes
3297	3297	Setup.Alarms.FlowAlarmTyp1	Word	R/W	alarm type flow limit comp1: 0=offFS 1=lowFS
3298	3298	Setup.Alarms.FlowAlarmTyp2	Word	R/W	alarm type flow limit comp2: 0=offFS 1=lowFS
3299	3299	Setup.Alarms.FlowAlarmTyp3	Word	R/W	alarm type flow limit comp3: 0=offFS 1=lowFS
3300	3300	Setup.Alarms.FlowAlarmTyp4	Word	R/W	alarm type flow limit comp4: 0=offFS 1=lowFS
3301	3301	Service.Measurement.DSPreset-Count	Word	R/W	counter of DSP resets
3305	3305	Service.AnalogOut.AOutAdjust-Start1	Short	R/W	offset value for fine adjustment of analog output1
3306	3306	Service.AnalogOut.AOutAdjust-Start2	Short	R/W	offset value for fine adjustment of analog output2
3307	3307	Service.AnalogOut.AOutAdjust-Start3	Short	R/W	offset value for fine adjustment of analog output3
3308	3308	Service.AnalogOut.AOutAdjust-Start4	Short	R/W	offset value for fine adjustment of analog output4
3309	3309	Service.AnalogOut.AOutAdju-stEnd1	Short	R/W	gain value for fine adjustment of analog output1
3310	3310	Service.AnalogOut.AOutAdju-stEnd2	Short	R/W	gain value for fine adjustment of analog output2
3311	3311	Service.AnalogOut.AOutAdju-stEnd3	Short	R/W	gain value for fine adjustment of analog output3
3312	3312	Service.AnalogOut.AOutAdju-stEnd4	Short	R/W	gain value for fine adjustment of analog output4
3313	3313	Setup.Display.MeasureLines. MeasLine5	Word	R/W	signal assigned to line1 of 2nd measurement display(0..n)
3314	3314	Setup.Display.MeasureLines. MeasLine6	Word	R/W	signal assigned to line2 of 2nd measurement display(0..n)
3315	3315	Setup.Display.MeasureLines. MeasLine7	Word	R/W	signal assigned to line3 of 2nd measurement display(0..n)
3316	3316	Setup.Display.MeasureLines. MeasLine8	Word	R/W	signal assigned to line4 of 2nd measurement display(0..n)
4001	4001	Status.NamurState	Word	RO	device‘s NAMUR state bit-field (b0:F, b1:M, b2:O, b3:C)
4002	4002	Status.DIO.PSAOutputState	Word	RO	DOut state of a PSA Card
4003	4003	Status.Calibration.CalValveState	Word	RO	current state of the valves: bit0=sample, b1=V4, b2=V1, b3=V2
4004	4004	Status.Calibration.CalibrationState	Word	RO	0=None 1=valve 2=purge 3=Zstart 4=Sstart 5=Zwait 6=Swait 7=cance
4005	4005	Status.Calibration.CalibrationCount	Word	RO	second decrementer for calibration and/or purging procedures

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
4006	4006	Status.DIO.OutputState1	Word	RO	Output state of a XDIO Card #1
4007	4007	Status.DIO.OutputState2	Word	RO	Output state of a XDIO Card #2
4008	4008	Status.DIO.InputState1	Word	RO	Input state of a Digital Input Card #1
4009	4009	Status.DIO.InputState2	Word	RO	Input state of a Digital Input Card #2
4010	4010	Service.AccessMode	Word	RO	0=Normal, 3=Service
4029	4029	Info.SensorVersion	Word	RO	Version number of sensor firmware
4030	4030	Info.SensorBuild	Word	RO	Build number of sensor firmware
4031	4031	Status.DIO.PSASHSState	Word	RO	state of a PSA Card‘s SHS
4033	4033	Info.InterfaceID	Word	RO	Interface which is communicated to (1 = Process, 2 = Service)
8001	5001… 5002	Status.NamurStates.NamurFailure	DWord	RO	Namur Failure bitfield
8002	5003… 5004	Status.NamurStates.NamurMaint	DWord	RO	Namur Maintenance Request bitfield
8003	5005… 5006	Status.NamurStates.NamurOffSpec	DWord	RO	Namur Off Specification bitfield
8004	5007… 5008	Status.NamurStates.NamurFct-Check	DWord	RO	Namur Function Check bitfield
8005	5009… 5010	Status.DeviceState	DWord	RO	device‘s state bit-field
8006	5011… 5012	Status.ChannelState.Channel-State1	DWord	RO	component1‘s state bitfield (b0:......)
8007	5013… 5014	Status.ChannelState.Channel-State2	DWord	RO	component2‘s state bitfield (b0:......)
8008	5015… 5016	Status.ChannelState.Channel-State3	DWord	RO	component3‘s state bitfield (b0:......)
8009	5017… 5018	Status.ChannelState.Channel-State4	DWord	RO	component4‘s state bitfield (b0:......)
8011	5021… 5022	Service.Status.NAMUR.Failure-Mask	DWord	R/W	Bitmask that disables failure sources
8012	5023… 5024	Service.Status.NAMUR.MaintMask	DWord	R/W	Bitmask that disables NAMUR maintenance request sources
8013	5025… 5026	Service.Status.NAMUR.OffSpec-Mask	DWord	R/W	Bitmask that disables NAMUR OffSpec sources
8014	5027… 5028	Service.Status.NAMUR.FctCheck-Mask	DWord	R/W	Bitmask that disables NAMUR FctCheck sources
9001	6001… 6002	Service.Measurement.PV1	Float	R/W	Concentration of component1 (in ppm)
9001	6001… 6002	Status.PV1	Float	RO	Concentration of component1 (in ppm)

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9002	6003… 6004	Service.Measurement.PV2	Float	R/W	Concentration of component2 (in ppm)
9002	6003… 6004	Status.PV2	Float	RO	Concentration of component2 (in ppm)
9003	6005… 6006	Service.Measurement.PV3	Float	R/W	Concentration of component3 (in ppm)
9003	6005… 6006	Status.PV3	Float	RO	Concentration of component3 (in ppm)
9004	6007… 6008	Service.Measurement.PV4	Float	R/W	Concentration of component4 (in ppm)
9004	6007… 6008	Status.PV4	Float	RO	Concentration of component4 (in ppm)
9005	6009… 6010	Status.Meas.RawMeasConcentra-tion1	Float	RO	raw ADC of measure-side component1
9006	6011… 6012	Status.Meas.RawMeasConcentra-tion2	Float	RO	raw ADC of measure-side component2
9007	6013… 6014	Status.Meas.RawMeasConcentra-tion3	Float	RO	raw ADC of measure-side component3
9008	6015… 6016	Status.Meas.RawMeasConcentra-tion4	Float	RO	raw ADC of measure-side component4
9009	6017… 6018	Setup.Measurement.AirPressure	Float	R/W	pressure (in hPa), if no pressure sensor installed then input
9009	6017… 6018	Status.Pressure	Float	RO	Air Pressure
9011	6021… 6022	Status.Meas.FlowSensor1	Float	RO	calculated flow of sensor1 in l/min
9012	6023… 6024	Status.Meas.FlowSensor2	Float	RO	calculated flow of sensor2 in l/min
9013	6025… 6026	Status.Meas.FlowSensor3	Float	RO	calculated flow of sensor3 in l/min
9014	6027… 6028	Status.Meas.FlowSensor4	Float	RO	calculated flow of sensor4 in l/min
9015	6029… 6030	Status.Meas.TempSensor1	Float	RO	calculated temperature 1 in °C
9016	6031… 6032	Status.Meas.TempSensor2	Float	RO	calculated temperature 2 in °C
9017	6033… 6034	Status.Meas.TempSensor3	Float	RO	calculated temperature 3 in °C
9018	6035… 6036	Status.Meas.TempSensor4	Float	RO	calculated temperature 4 in °C
9019	6037… 6038	Status.Meas.SourceCurrent1	Float	RO	source current of component 1 in mA

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9020	6039… 6040	Status.Meas.SourceCurrent2	Float	RO	source current of component 2 in mA
9021	6041… 6042	Status.Meas.SourceCurrent3	Float	RO	source current of component 3 in mA
9022	6043… 6044	Status.Meas.SourceCurrent4	Float	RO	source current of component 4 in mA
9023	6045… 6046	Status.Meas.RawRefConce1	Float	RO	raw ADC of reference side component1
9024	6047… 6048	Status.Meas.RawRefConce2	Float	RO	raw ADC of reference side component2
9025	6049… 6050	Status.Meas.RawRefConce3	Float	RO	raw ADC of reference side component3
9026	6051… 6052	Status.Meas.RawRefConce4	Float	RO	raw ADC of reference side component4
9027	6053… 6054	Status.Meas.RawQuotConce1	Float	RO	raw ADC quotient of component1
9028	6055… 6056	Status.Meas.RawQuotConce2	Float	RO	raw ADC quotient of component2
9029	6057… 6058	Status.Meas.RawQuotConce3	Float	RO	raw ADC quotient of component3
9030	6059… 6060	Status.Meas.RawQuotConce4	Float	RO	raw ADC quotient of component4
9031	6061… 6062	Info.StartOfRange1	Float	RO	start of range of component1
9031	6061… 6062	Service.Measurement.StartO-fRange1	Float	RO	start of range of component1
9032	6063… 6064	Info.StartOfRange2	Float	RO	start of range of component2
9032	6063… 6064	Service.Measurement.StartO-fRange2	Float	RO	start of range of component2
9033	6065… 6066	Info.StartOfRange3	Float	RO	start of range of component3
9033	6065… 6066	Service.Measurement.StartO-fRange3	Float	RO	start of range of component3
9034	6067… 6068	Info.StartOfRange4	Float	RO	start of range of component4
9034	6067… 6068	Service.Measurement.StartO-fRange4	Float	RO	start of range of component4
9035	6069… 6070	Info.EndOfRange1	Float	RO	end of range of component1
9035	6069… 6070	Service.Measurement.En-dOfRange1	Float	R/W	end of range of component1

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9036	6071… 6072	Info.EndOfRange2	Float	RO	end of range of component2
9036	6071… 6072	Service.Measurement.EndOfRange2	Float	R/W	end of range of component2
9037	6073… 6074	Info.EndOfRange3	Float	RO	end of range of component3
9037	6073… 6074	Service.Measurement.EndOfRange3	Float	R/W	end of range of component3
9038	6075… 6076	Info.EndOfRange4	Float	RO	end of range of component4
9038	6075… 6076	Service.Measurement.EndOfRange4	Float	R/W	end of range of component4
9039	6077… 6078	Info.LowestEndRange1	Float	RO	min. range of comp1 that keeps specs
9039	6077… 6078	Service.Measurement.LowestEndRange1	Float	R/W	min. range of comp1 that keeps specs
9040	6079… 6080	Info.LowestEndRange2	Float	RO	min. range of comp2 that keeps specs
9040	6079… 6080	Service.Measurement.LowestEndRange2	Float	R/W	min. range of comp2 that keeps specs
9041	6081… 6082	Info.LowestEndRange3	Float	RO	min. range of comp3 that keeps specs
9041	6081… 6082	Service.Measurement.LowestEndRange3	Float	R/W	min. range of comp3 that keeps specs
9042	6083… 6084	Info.LowestEndRange4	Float	RO	min. range of comp4 that keeps specs
9042	6083… 6084	Service.Measurement.LowestEndRange4	Float	R/W	min. range of comp4 that keeps specs
9043	6085… 6086	Setup.In/Outputs.AnalogOut.AOutStartRange1	Float	R/W	level (ppm) where analoge output scaling starts for comp1
9044	6087… 6088	Setup.In/Outputs.AnalogOut.AOutStartRange2	Float	R/W	level (ppm) where analoge output scaling starts for comp2
9045	6089… 6090	Setup.In/Outputs.AnalogOut.AOutStartRange3	Float	R/W	level (ppm) where analoge output scaling starts for comp3
9046	6091… 6092	Setup.In/Outputs.AnalogOut.AOutStartRange4	Float	R/W	level (ppm) where analoge output scaling starts for comp4
9047	6093… 6094	Setup.In/Outputs.AnalogOut.AOutEndRange1	Float	R/W	level (ppm) where analoge output scaling ends for comp1
9048	6095… 6096	Setup.In/Outputs.AnalogOut.AOutEndRange2	Float	R/W	level (ppm) where analoge output scaling ends for comp2
9049	6097… 6098	Setup.In/Outputs.AnalogOut.AOutEndRange3	Float	R/W	level (ppm) where analoge output scaling ends for comp3

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9050	6099… 6100	Setup.In/Outputs.AnalogOut.AOu-tEndRange4	Float	R/W	level (ppm) where analoge output scaling ends for comp4
9051	6101… 6102	Setup.Calibration.ZeroGasValue1	Float	R/W	value for comp1 (in ppm) which a zero calibration adjusts to
9052	6103… 6104	Setup.Calibration.ZeroGasValue2	Float	R/W	value for comp2 (in ppm) which a zero calibration adjusts to
9053	6105… 6106	Setup.Calibration.ZeroGasValue3	Float	R/W	value for comp3 (in ppm) which a zero calibration adjusts to
9054	6107… 6108	Setup.Calibration.ZeroGasValue4	Float	R/W	value for comp4 (in ppm) which a zero calibration adjusts to
9055	6109… 6110	Status.Calibration.ZeroOffset1	Float	RO	offset for comp1 determined by zero calibration
9056	6111… 6112	Status.Calibration.ZeroOffset2	Float	RO	offset for comp2 determined by zero calibration
9057	6113… 6114	Status.Calibration.ZeroOffset3	Float	RO	offset for comp3 determined by zero calibration
9058	6115… 6116	Status.Calibration.ZeroOffset4	Float	RO	offset for comp4 determined by zero calibration
9061	6121… 6122	Setup.Calibration.SpanGasValue1	Float	R/W	value for comp1 (in ppm) which a span calibration adjusts to
9062	6123… 6124	Setup.Calibration.SpanGasValue2	Float	R/W	value for comp2 (in ppm) which a span calibration adjusts to
9063	6125… 6126	Setup.Calibration.SpanGasValue3	Float	R/W	value for comp3 (in ppm) which a span calibration adjusts to
9064	6127… 6128	Setup.Calibration.SpanGasValue4	Float	R/W	value for comp4 (in ppm) which a span calibration adjusts to
9065	6129… 6130	Status.Calibration.FactZeroOffset1	Float	RO	zero correction value comp1 determined in factory
9066	6131… 6132	Status.Calibration.FactZeroOffset2	Float	RO	zero correction value comp2 determined in factory
9067	6133… 6134	Status.Calibration.FactZeroOffset3	Float	RO	zero correction value comp 3 determined in factory
9068	6135… 6136	Status.Calibration.FactZeroOffset4	Float	RO	zero correction value comp2 determined in factory
9071	6141… 6142	Setup.Display.Component.PVAuni-tOffset1	Float	R/W	offset to convert ppm into displayed PrimVaria-bleUnit1
9072	6143… 6144	Setup.Display.Component.PVAuni-tOffset2	Float	R/W	offset to convert ppm into displayed PrimVaria-bleUnit2
9073	6145… 6146	Setup.Display.Component.PVAuni-tOffset3	Float	R/W	offset to convert ppm into displayed PrimVaria-bleUnit3
9074	6147… 6148	Setup.Display.Component.PVAuni-tOffset4	Float	R/W	offset to convert ppm into displayed PrimVaria-bleUnit4

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9075	6149… 6150	Setup.Display.Component.PVAu-nitFactor1	Float	R/W	factor to convert ppm into displayed PrimVaria-bleUnit1
9076	6151… 6152	Setup.Display.Component.PVAu-nitFactor2	Float	R/W	factor to convert ppm into displayed PrimVaria-bleUnit2
9077	6153… 6154	Setup.Display.Component.PVAu-nitFactor3	Float	R/W	factor to convert ppm into displayed PrimVaria-bleUnit3
9078	6155… 6156	Setup.Display.Component.PVAu-nitFactor4	Float	R/W	factor to convert ppm into displayed PrimVaria-bleUnit4
9081	6161… 6162	Setup.Alarms.Limit1Level1	Float	R/W	comp1 alarm level (ppm) for limit1
9082	6163… 6164	Setup.Alarms.Limit1Level2	Float	R/W	comp2 alarm level (ppm) for limit1
9083	6165… 6166	Setup.Alarms.Limit1Level3	Float	R/W	comp3 alarm level (ppm) for limit1
9084	6167… 6168	Setup.Alarms.Limit1Level4	Float	R/W	comp4 alarm level (ppm) for limit1
9085	6169… 6170	Setup.Alarms.Limit2Level1	Float	R/W	comp1 alarm level (ppm) for limit2
9086	6171… 6172	Setup.Alarms.Limit2Level2	Float	R/W	comp2 alarm level (ppm) for limit2
9087	6173… 6174	Setup.Alarms.Limit2Level3	Float	R/W	comp3 alarm level (ppm) for limit2
9088	6175… 6176	Setup.Alarms.Limit2Level4	Float	R/W	comp4 alarm level (ppm) for limit2
9089	6177… 6178	Setup.Alarms.LimitHysteresis1	Float	R/W	alarm hysteresis for limits of comp1 in percent of range
9090	6179… 6180	Setup.Alarms.LimitHysteresis2	Float	R/W	alarm hysteresis for limits of comp2 in percent of range
9091	6181… 6182	Setup.Alarms.LimitHysteresis3	Float	R/W	alarm hysteresis for limits of comp3 in percent of range
9092	6183… 6184	Setup.Alarms.LimitHysteresis4	Float	R/W	alarm hysteresis for limits of comp4 in percent of range
9093	6185… 6186	Status.Temperature1	Float	RO	calculated temperature 1 in °C
9094	6187… 6188	Status.Temperature2	Float	RO	calculated temperature 2 in °C
9095	6189… 6190	Status.Temperature3	Float	RO	calculated temperature 3 in °C
9096	6191… 6192	Status.Temperature4	Float	RO	calculated temperature 4 in °C
9097	6193… 6194	Status.Flow1	Float	RO	flow component1 in l/min

9.4 List of Parameters and Registers - Sorted by Registers

Address		Tag Name	Data Type	Client Access	Description
Daniel	Modicon				
9098	6195… 6196	Status.Flow2	Float	RO	flow component2 in l/min
9099	6197… 6198	Status.Flow3	Float	RO	flow component3 in l/min
9100	6199… 6200	Status.Flow4	Float	RO	flow component4 in l/min
9101	6201… 6202	Setup.Alarms.FlowLimLevel1	Float	R/W	flow alarm level (l/min) for comp1
9102	6203… 6204	Setup.Alarms.FlowLimLevel2	Float	R/W	flow alarm level (l/min) for comp3
9103	6205… 6206	Setup.Alarms.FlowLimLevel3	Float	R/W	flow alarm level (l/min) for comp3
9104	6207… 6208	Setup.Alarms.FlowLimLevel4	Float	R/W	flow alarm level (l/min) for comp4
9105	6209… 6210	Status.PV1_Dis	Float	RO	Concentration of comp1 (in unit of display)
9106	6211… 6212	Status.PV2_Dis	Float	RO	Concentration of comp2 (in unit of display)
9107	6213… 6214	Status.PV3_Dis	Float	RO	Concentration of comp3 (in unit of display)
9108	6215… 6216	Status.PV4_Dis	Float	RO	Concentration of comp4 (in unit of display)

Chapter 10
Service Information

10.1 Return Of Material

If factory repair of defective equipment is required, proceed as follows:

1. Secure a return authorization from a Rosemount Analytical Sales Office or Representative before returning the equipment. Equipment must be returned with complete identification in accordance with Rosemount instructions or it will not be accepted.
2. In no event will Rosemount be responsible for equipment without proper authorization and identification.
3. Carefully pack defective unit in a sturdy box with sufficient shock absorbing material to ensure no additional damage will occur during shipping.

   The completed and signed Declaration of Decontamination (☞ A.6, page A-33) must be included with the instrument (we recommend to attach it to the packaging outside)!

4. In a cover letter, describe completely:
   a. The symptoms that determined the equipment is faulty.
   b. The environment in which the equipment was operating (housing, weather, vibration, dust, etc.).
   c. Site from which equipment was removed.
   d. Whether warranty service or non-warranty service is requested.
   e. Complete shipping instructions for the return of the equipment.
5. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in a Rosemount Return Authorization, prepaid, to:

   In Europe:
   Emerson Process Management
   GmbH & Co. OHG
   Service Department
   Deutschland
   +49 6055 884-470/-472

   In US:
   Emerson Process Management
   Rosemount Analytical Inc.
   Customer Service Center
   1-800-433-6076
   1-440-914-1261

   In Asia Pacific:
   Emerson Process Management
   Asia Pacific Pte Limited
   Singapore
   +65-6-777-8211

If warranty service is expected, the defective unit will be carefully inspected and tested at the factory. If failure was due to conditions listed in the standard Rosemount warranty, the defective unit will be repaired or replaced at Rosemount's option, and an operating unit will be returned to the customer in accordance with shipping instructions furnished in the cover letter.
For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

10 Service Information

10.2 Customer Service

For order administration, replacement parts, applicaton assistance, on-site or factory repair, service or maintenance contract information, contact:

In Europe:

Emerson Process Management
GmbH & Co. OHG
Service Department
Germany
T +49 6055 884-470/-472

In US:

Emerson Process Management
Rosemount Analytical Inc.
Customer Service Center
T 1-800-433-6076
T 1-440-914-1261

In Asia Pacific:

Emerson Process Management
Asia Pacific Pte Limited
1 Pandan Crescent
Singapore 128461
T +65-6-777-8211

10.3 Training

A comprehensive Factory Training Program of operator and service classes is available. For a copy of the training schedule contact:

In Europe:

Emerson Process Management
GmbH & Co. OHG
Service Department
Germany
T +49 6055 884-470/-472

In US:

Emerson Process Management
Rosemount Analytical Inc.
Customer Service Center
T 1-800-433-6076
T 1-440-914-1261

In Asia Pacific:

Emerson Process Management
Asia Pacific Pte Limited
1 Pandan Crescent
Singapore 128461
T +65-6-777-8211

Chapter 11
Dismounting and Disposal

11.1 Dismounting and Diposal of the Analyzer

WARNING

HAZARDS FROM DISMOUNTING

Dismounting instruments installed in hazardous area requires special documents to be issued and instructions to be followed! Do not dismount such instruments without written permit!

Failure to follow may result in explosion!

Gas lines may contain unhealthy or toxic gases, depending on the application, the instrument has been used for! Take care to purge such gas lines prior to disconnection, to remove all unhealthy or toxic components.

WARNING

HAZARD BY VOLTAGE

Dismounting is permitted to qualified and instructed personnel only, with indepth knowledge of resulting risks, technical and legislative requirements.

Failure to follow may result in personal injury or death.

Disconnect from power instruments with screw terminals before starting to work, e. g. by switching off the disconnect switch in the installation.

CAUTION

HEAVY INSTRUMENT

X-STREAM fieldhousings, intended for outside and wall mounted use, weigh between 26 kg (57 lb) and 63 kg (139 lb), depending on version and options installed.

Two people and/or lifting equipment is required to lift and carry these units.

11 Dismounting & Disposal

When the instrument has reached the end of its useful life, do not throw it in a trash can!

This instrument has been made of materials to be recycled by waste disposal contractors specialised in this field. Let the instrument and the packing material duly disposed of in environmentally sound manner. Ensure the equipment is free of dangerous and harmful substances (decontaminated).

Take care of all local regulations for waste treatment.

Advice concerning the disposal of chemicals

This instrument may contain electrochemical sensors, e. g. for measuring $O_{2.}$ For these sensors applies:

- Don‘t dispose of together with household carbage.
- At the end of useful life, the instrument and the sensors must be disposed of in compliance with the wast regulations, see instructions below.

Advice concerning the disposal of chemicals

This instrument may contain electrochemical sensors, e. g. for measuring O_2. For these sensors the same applies as to the battery:

- Don‘t dispose of together with household carbage.
- At the end of their or the instruments useful life, the sensors must be disposed of in compliance with the wast regulations, see instructions below.

When the instrument has reached the end of its useful life,

- purge all gas lines with inert gas
- ensure all gas lines are pressureless
- disconnect all gas lines
- switch off power and signal lines
- disconnect and remove all electrical connections
- for wall mounted instruments, support the instrument before loosening the fixing screws.
- properly fill out the Declaration of Decontamination (☞ A-35)
- hand over the dismounted instrument together with the Declaration of Decontamination to a waste disposal contractor. This contractor then has to disassemble the instrument, recycle and dispose of in compliance with all applicable waste treatment regulations.

Appendix

This chapter contains

an excerpt from the Modbus publication "Modbus_over_serial_line“	☞	A.1, page A-2
EC declaration of conformity	☞	A.2, page A-12
CSA Certificate of Compliance	☞	A.3, page A-14
Block diagram	☞	A.4, page A-21
Water Vapor: Conversion of Dewpoint, Vol.-% and g/Nm³	☞	A.5, page A-31
Declaration of Deontamination	☞	A.6, page A-33
Assignment of Terminals and Sockets	☞	A.7, page A-35

A.1 Modbus Specification

MODBUS over Serial Line

Specification and Implementation Guide

V1.02

A.1 Modbus Specification

3 Physical Layer

3.1 Preamble

A new MODBUS solution over serial line should implement an electrical interface in accordance with EIA/TIA-485 standard (also known as RS485 standard). This standard allows point to point and multipoint systems, in a "two-wire configuration". In addition, some devices may implement a "Four-Wire" RS485-Interface.

A device may also implement an RS232-Interface.

In such a MODBUS system, a Master Device and one or several Slave Devices communicate on a passive serial line.

On standard MODBUS system, all the devices are connected (in parallel) on a trunk cable constituted by 3 conductors. Two of those conductors (the "Two-Wire" configuration) form a balanced twisted pair, on which bi-directional data are transmitted, typically at the bit rate of 9600 bits per second.

Each device may be connected (see figure 19):

- either directly on the trunk cable, forming a daisy-chain,
- either on a passive Tap with a derivation cable,
- either on an active Tap with a specific cable.

Screw Terminals, RJ45, or D-shell 9 connectors may be used on devices to connect cables (see the chapter "Mechanical Interfaces").

3.2 Data Signaling Rates

9600 bps and 19.2 Kbps are required and 19.2 is the required default

Other baud rates may optionally be implemented : 1200, 2400, 4800, … 38400 bps, 56 Kbps, 115 Kbps, …

Every implemented baud rate must be respected better than 1% in transmission situation, and must accept an error of 2% in reception situation.

A.1 Modbus Specification

3.3 Electrical Interfaces

3.3.1 Multipoint Serial Bus Infrastructure

Figure 19 gives a general overview of the serial bus infrastructure in a MODBUS multipoint Serial Line system.

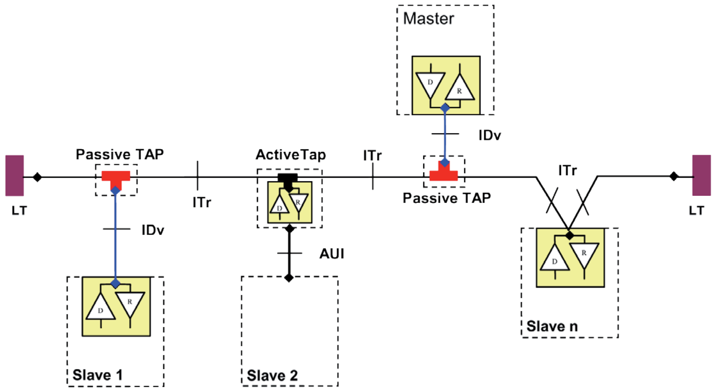


Figure 19 : Serial bus infrastructure

A multipoint MODBUS Serial Line bus is made of a principal cable (**the Trunk**), and possibly some **derivation** cables.
Line terminations are necessary at each extremity of the trunk cable for impedance adaptation (see § "Two-Wire MODBUS Definition" & "Optional Four-Wire MODBUS Definition" for details).

As shown in figure 19, different implementations may operate in the same MODBUS Serial Line system :

- the device integrates the communication transceiver and is connected to the trunk using a **Passive Tap** and a derivation cable (case of Slave 1 and Master) ;
- the device doesn't integrate the communication transceiver and is connected to the trunk using an **Active Tap** and a derivation cable (the active TAP integrates the transceiver) (case of Slave 2) ;
- the device is connected directly to the trunk cable, in a **Daisy-Chain** (case of Slave n)

The following conventions are adopted :

- The interface with the **trunk** is named **ITr** (Trunk Interface)
- The interface between the device and the **Passive Tap** is named **IDv** (Derivation Interface)
- The interface between the device and the **Active Tap** is named **AUI** (Attachment Unit Interface)

Remarks :

1. In some cases, the Tap may be connected directly to the IDv-socket or the AUI-socket of the device, without using a derivation cable.
2. A Tap may have several IDv sockets to connect several devices. Such a Tap is named **Distributor** when it is a passive one.
3. When using an active Tap, power supply of the Tap may be provided either via its AUI or ITr interface.

ITr and **IDv** interfaces are described in the following chapters (see § "Two-Wire MODBUS DEFINITION" & "Four-Wire MODBUS DEFINITION").

A.1 Modbus Specification

3.3.2 Two-Wire MODBUS Definition

A MODBUS solution over serial line should implement a “Two-Wire” electrical interface in accordance with EIA/TIA-485 standard.

On such a 2W-bus, at any time one driver only has the right for transmitting.

In fact a third conductor must also interconnect all the devices of the bus : the common.

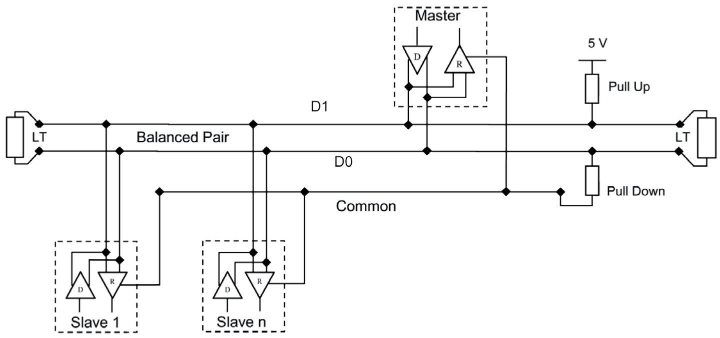


Figure 20: General 2-Wire Topology

2W-MODBUS Circuits Definition

Required Circuits on ITr	on IDv	**For device**	**Required on device**	**EIA/TIA-485 name**	**Description**
D1	D1	I/O	**X**	B/B’	**Transceiver terminal 1, V1 Voltage** (V1 > V0 for binary 1 [OFF] state)
D0	D0	I/O	**X**	A/A’	**Transceiver terminal 0, V0 Voltage** (V0 > V1 for binary 0 [ON] state)
Common	Common	--	**X**	C/C’	Signal and optional Power Supply Common

Notes :

- For Line Termination (LT), Pull Up and Pull Down resistors, please refer to section “Multipoint System requirements".
- D0, D1, and Common circuit names must be used in the documentation related to the device and the Tap (User Guide, Cabling Guide, …) to facilitate interoperability.
- Optional electrical interfaces may be added, for example :
  - **Power Supply :** 5..24 V D.C.
  - **Port mode control :** PMC circuit (TTL compatible). When needed, port mode may be controlled either by this external circuit and/or by another way (a switch on the device for example). In the first case while an open circuit PMC will ask for the 2W-MODBUS mode, a Low level on PMC will switch the port into 4W-MODBUS or RS232-MODBUS Mode, depending on the implementation.

A.1 Modbus Specification

3.3.3 Optional Four-Wire MODBUS Definition

Optionally, such MODBUS devices also permit to implement a **2-pair** bus (4 wires) of mono directional data. The data on the **master pair** (RXD1-RXD0) are only received by the slaves ; the data on the **slave pair** (TXD1-TXD0) are only received by the only master.

In fact a fifth conductor must also interconnect all the devices of the 4W-bus : the common.

In the same way as on a 2W-MODBUS, at any time one driver only has the right for emitting.

Such a device must implement, for each balanced pair, a driver and a transceiver **in accordance with EIA/ TIA-485**. (Sometimes this solution has been named "RS422", which is not correct : the RS422 standard does not support several drivers on one balanced pair.)

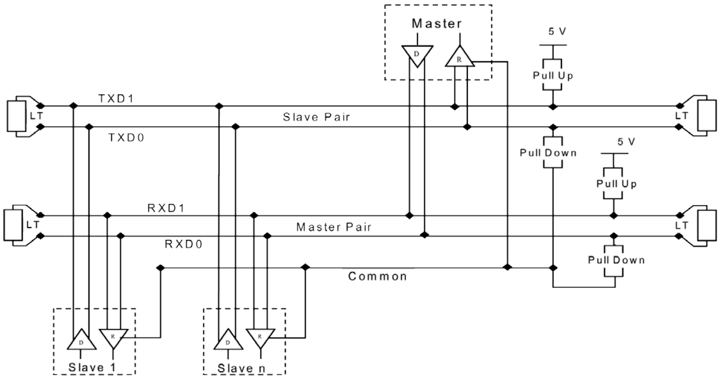


Figure 21: General 4-wire topology

Optional 4W-MODBUS Circuits Definition

Required Circuits on ITr	Required Circuits on IDv	For device	Required on device	EIA/TIA-485 name	Description for IDv
TXD1	TXD1	Out	**X**	B	**Generator terminal 1,** Vb Voltage (Vb > Va for binary 1 [OFF] state)
TXD0	TXD0	Out	**X**	A	**Generator terminal 0**, Va Voltage (Va > Vb for binary 0 [ON] state)
RXD1	RXD1	In	**(1)**	B'	**Receiver terminal 1**, Vb' Voltage (Vb' > Va' for binary 1 [OFF] state)
RXD0	RXD0	In	**(1)**	A'	**Receiver terminal 0**, Va' Voltage (Va' > Vb' for binary 0 [ON] state)
Common	Common	--	**X**	C/C'	Signal and optional Power Supply **Common**

Notes :

- For Line Termination (LT), Pull Up and Pull Down resistors, please refer to section "Multipoint System requirements".
- Those circuits **(1)** are required only if an 4W-MODBUS option is implemented.
- The name of the 5 required circuits must be used in the documentation related to the device and the Tap (User Guide, Cabling Guide, …) to facilitate interoperability.
- Optional electrical interfaces may be added, for example :
  - **Power Supply :** 5..24 V D.C.
  - **PMC circuit :** See above (In 2W-MODBUS Circuits Definition) the note about this optional circuit.

A.1 Modbus Specification

3.3.3.1 4W-Cabling System Important Topic

In such a 4W-MODBUS, Master Device and Slave Devices have IDv interfaces with the same 5 required circuits.
As the master has to :

- receive from the slave the data on the slave pair (TXD1-TXD0),
- and transmit on the master pair (RXD1-RXD0 , received by the slaves) ,

the 4W-cabling system <u>must</u> cross the two pairs of the bus between ITr and the IDv of the master :

	Signal on Master IDv		EIA/TIA-485 Name	Circuit on ITr
	Name	Type		
Slave Pair	RXD1	In	B'	TXD1
	RXD0	In	A'	TXD0
Master Pair	TXD1	Out	B	RXD1
	TXD0	Out	A	RXD0
	Common	--	C/C'	Common

This crossing may be implemented by crossed cables, but the connection of such crossed cables in a 2-wire system may cause damages. To connect a 4W master device (which have a MODBUS connector) a better solution is to use a Tap which includes the crossing function.

3.3.3.2 Compatibility between 4-Wire and 2-Wire cabling

In order to connect devices implementing a 2-Wire physical interface to an already existing 4-Wire system, the 4-Wire cabling system can be modified as described below :

- TxD0 signal shall be wired with the RxD0 signal, turning them to the D0 signal
- TxD1 signal shall be wired with the RxD1 signal, turning them to the D1 signal.
- Pull-up, Pull-down and line terminations resistors shall be re-arranged to correctly adapt the D0, D1 signals.

A.1 Modbus Specification

The figure hereafter gives an example where slaves 2 and 3 which use a 2-Wire interface can operate with the Master and the slave 1 which use a 4-Wire interface.

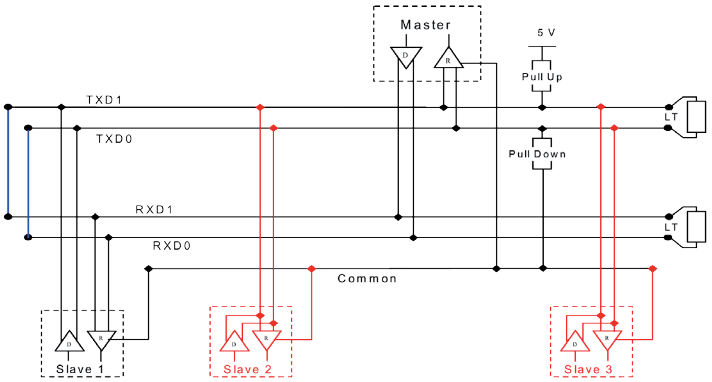


Figure 22 : Changing a 4-Wire cabling system into a 2-Wire cabling system

In order to connect devices implementing a 4-Wire physical interface to an already existing 2-Wire system, the 4-Wire interface of the new coming devices can be arranged as describe below :

On each 4-Wire device interface :

- TxD0 signal shall be wired with the RxD0 signal and then connected to the D0 signal of the trunk ;
- TxD1 signal shall be wired with the RxD1 signal and then connected to the D1 signal of the trunk.

The figure hereafter gives an example where slaves 2 and 3 which use a 4-Wire interface can operate with the Master and the slave 1 which use a 2-Wire interface.

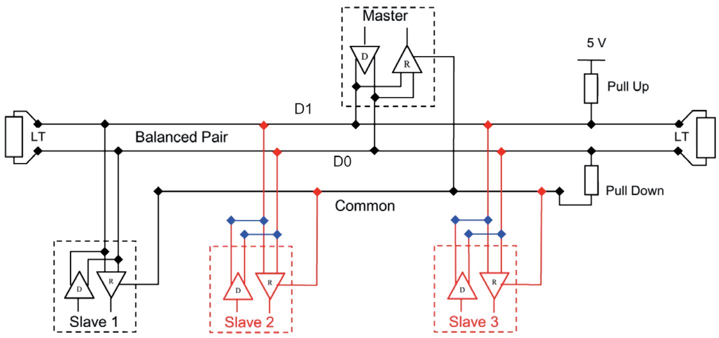


Figure 23 : Connecting devices with 4-Wire interface to a 2-Wire cabling system

A.1 Modbus Specification

3.3.4 RS232-MODBUS Definition

Some devices may implement an RS232-Interface between a DCE and a DTE.

Optional RS232-MODBUS Circuits Definition

Signal	For DCE	Required on DCE (1)	Required on DTE (1)	Description
Common	--	X	X	**Signal Common**
CTS	In			Clear to Send
DCD	--			Data Carrier Detected (from DCE to DTE)
DSR	In			Data Set Ready
DTR	Out			Data Terminal Ready
RTS	Out			Request to Send
RXD	In	X	X	**Received Data**
TXD	Out	X	X	**Transmitted Data**

Notes :

- "X" marked signals are required only if an RS232-MODBUS option is implemented.
- Signals are in accordance with EIA/ TIA-232.
- Each TXD must be wired with RXD of the other device ;
- RTS may be wired with CTS of the other device,
- DTR may be wired with DSR of the other device.
- Optional electrical interfaces may be added, for example :
  - **Power Supply :** 5..24 V D.C.
  - **PMC circuit :** See above (In 2W-MODBUS Circuits Definition) the note about this optional circuit.

3.3.5 RS232-MODBUS requirements

This optional MODBUS on Serial Line system should only be used for short length (typically less than 20m) point to point inter-connection.

Then, the EIA/TIA-232 standard must be respected :

⇒ circuits definition,

⇒ maximum wire capacitance to ground (2500 pF, then 25 m for a 100 pF/m cable).

Please refer to chapter "Cables" for the shield, and for the possibility to use Category 5 Cables.

Documentation of the device must indicate :

⇒ if the device must be considered as a DCE either as a DTE,

⇒ how optional circuits must work if such is the case.

A.1 Modbus Specification

3.4 Multipoint System requirements

For any EIA/ TIA-485 multipoint system, in either 2-wire or 4-wire configuration, the following requirements all apply.

3.4.1 Maximum number of devices without repeater

A figure of **32 devices** is always authorized on any RS485-MODBUS system without repeater.

Depending of :

- all the possible addresses,
- the figure of RS485 Unit Load used by the devices,
- and the line polarization in need be,

A RS485 system may implement a larger number of devices. Some devices allow the implementation of a RS485-MODBUS serial line with more than 32 devices, without repeater.

In this case these MODBUS devices must be documented to say how many of such devices are authorized without repeater.

The use of a **repeater** between two heavy loaded RS485-MODBUS is also possible.

3.4.2 Topology

An RS485-MODBUS configuration without repeater has one trunk cable, along which devices are connected, directly (daisy chaining) or by short derivation cables.

The trunk cable, also named “Bus”, can be long (see hereafter). Its two ends must be connected on Line Terminations.

The use of repeaters between several RS485-MODBUS is also possible.

3.4.3 Length

The end to end length of the **trunk cable** must be limited. The maximum length depends on the baud rate, the cable (Gauge, Capacitance or Characteristic Impedance), the number of loads on the daisy chain, and the network configuration *(2-wire or 4-wire)*.

For a maximum 9600 Baud Rate and AWG26 (or wider) gauge, the maximum length is 1000m. In the specific case shown in the figure 22 (4 Wire cabling used as a 2 Wire cabling system) the maximum length must be divided by two.

The **derivations** must be short, never more than 20m. If a multi-port tap is used with n derivations, each one must respect a maximum length of 40m divided by n.

3.4.4 Grounding Arrangements

The « Common » circuit (Signal and optional Power Supply Common) must be connected directly to protective ground, preferably at **one point only** for the entire bus. Generally this point is to choose on the master device or on its Tap.

3.4.5 Line Termination

A reflection in a transmission line is the result of an impedance discontinuity that a travelling wave sees as it propagates down the line. To minimize the reflections from the end of the RS485-cable it is required to place a Line Termination **near each of the 2 Ends** of the Bus.

It is important that the line be terminated at **both** ends since the propagation is bi-directional, but it is not allowed to place more than 2 LT on one passive D0-D1 balanced pair . Never place any LT on a derivation cable.

A.1 Modbus Specification

Each line termination must be connected between the two conductors of the balanced line : D0 and D1.

Line termination may be a 150 ohms value (0.5 W) resistor.

A serial capacitor (1 nF, 10 V minimum) with a 120 Ohms (0.25 W) resistor is a better choice when a polarization of the pair must be implemented (see here after).

In a 4W-system, each pair must be terminated at each end of the bus.

In an RS232 interconnections, no termination should be wired.

3.4.6 Line Polarization

When there is no data activity on an RS-485 balanced pair, the lines are not driven and, thus susceptible to external noise or interference. To insure that its receiver stays in a constant state, when no data signal is present, some devices need to bias the network.

Each MODBUS device must be documented to say :

- if the device needs a line polarization,
- if the device implements, or can implement, such a line polarization.

If one or several devices need polarization, **one** pair of resistors must be connected on the RS-485 balanced pair :

- a Pull-Up Resistor to a 5V Voltage on D1 circuit,
- a Pull-Down Resistor to the common circuit on D0 circuit.

The value of those resistors must be between 450 Ohms and 650 Ohms. 650 Ohms resistors value may allow a higher number of devices on the serial line bus.

In this case, a polarization of the pair must be implemented **at one location for the whole Serial Bus**. Generally this point is to choose on the master device or on its Tap. Other devices must not implement any polarization.

The maximum number of devices authorized on such a MODBUS Serial Line is reduced by 4 from a MODBUS without polarization.

A.2 EC Declaration of Conformity

EC DECLARATION OF CONFORMITY

Document number: RAE/X-STREAM 2 DC-E1
Date: March 2008

We,

Emerson Process Management GmbH & Co. OHG

located at

Industriestrasse 1, D-63594 Hasselroth, Germany

declare under our sole responsibility that our gas analyzer, type

X-STREAM 2

to which this declaration relates is in conformity with the provisions of:

2004/108/EC **EMC Directive**
with the application of the harmonized standards:

EN 61326-1:2006	Electrical equipment for measurement, control and laboratory use - EMC requirements

---

97/23/EC **Pressure Equipment Directive**
This analyzer has been designed and manufactured considering article 3, paragraph 3 of the above mentioned directive and therefore CE marking does not refer to this directive.

This document covers all ½ 19“ X-STREAM 2 gas analyzer variations with DC power supply.

Hasselroth, March 2008

....
(Signature)

Andy Kemish
(Name)

VP Rosemount Analytical Europe
(Function name)

ROSEMOUNT Analytical

EMERSON. Process Management

This declaration confirms the compliance with announced directives but does not include the assurance of properties.
The safety and installation instructions of the documentation have to be followed.

A.2 EC Declaration of Conformity

EC DECLARATION OF CONFORMITY

Document number: RAE/X-STREAM X2 AC-E2
Date: April 2011

We,

Emerson Process Management GmbH & Co. OHG

located at

Industriestrasse 1, D-63594 Hasselroth, Germany

declare under our sole responsibility that our gas analyzer, type

X-STREAM X2

to which this declaration relates is in conformity with the provisions of:

2004/108/EC **EMC Directive**
with the application of the harmonized standards including the latest amendments:

EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

---

2006/95/EC **Low Voltage Directive**
with the application of the harmonized standards:

EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use
Part 1: General requirements

Last two digits of the year in which the CE marking was affixed: 08

97/23/EC **Pressure Equipment Directive**
This analyzer has been designed and manufactured considering article 3, paragraph 3 of the above mentioned directive and therefore CE marking does not refer to this directive.

This declaration applies to all X-STREAM X2 gas analyzer variations for general purpose applications, to be supplied by an AC power source.

Hasselroth, April 2011

....
(Signature)

Andy Kemish
(Name)

VP Rosemount Analytical Europe
(Function name)

ROSEMOUNT Analytical

EMERSON. Process Management

This declaration confirms the compliance with announced directives but does not include the assurance of properties.
The safety and installation instructions of the documentation have to be followed.

Appendix A

A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate of Compliance

Certificate:	1714037 (LR 105173)	**Master Contract:**	185562
Project:	2507282	**Date Issued:**	March 14, 2012

Issued to: **Emerson Process Management**
GmbH & Co. OHG
Industriestrasse 1
Hasselroth, 63594
Germany
Attention: Uwe Schmidt

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Nicholas Cameron

Issued by: Nicholas Cameron

PRODUCTS

CLASS 2258 02	- PROCESS CONTROL EQUIPMENT - For Hazardous Locations
CLASS 2258 82	- PROCESS CONTROL EQUIPMENT - For Hazardous Locations - Certified to US Standards
CLASS 8721 05	- LABORATORY EQUIPMENT - Electrical
CLASS 8721 85	- ELECTRICAL EQUIPMENT FOR LABORATORY USE - Certified to US Standards

CLASS 8721 05 - LABORATORY ELECTRICAL EQUIPMENT

CLASS 8721 85 - ELECTRICAL EQUIPMENT FOR LABORATORY USE (Certified to U.S. Standards)

Gas analyzer, Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 3 - 1.5A, Class I, Pollution Degree II.

- **X-STREAM (XLF) or X-STREAM Enhanced Field Housing Gas Analyzer (XEF)**: Wall mounting with field wiring terminals, for outdoor use type 4 & IP66 and display;
- **X-STREAM (X2GP) or X-STREAM Enhanced (XEGP) General Purpose Gas Analyzer:** Table Top or Rack Mount with appliance inlet for indoor use and display (optional with field wiring terminals for indoor use);
- **X-STREAM Gas Analyzer Core (XCA)** Table Top or Rack Mount with appliance inlet for indoor use and no display (optional with field wiring terminals for indoor use);

DQD 507 Rev. 2009-09-01 Page: 1

A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate: 1714037 (LR 105173) **Master Contract:** 185562

Project: 2507282 **Date Issued:** March 14, 2012

Gas analyzer, Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 1, 3 – 0,7A, Class I, Pollution Degree II.

- **X-STREAM Gas Analyzer Core Compact (XCK)** Table Top or Rack Mount with appliance inlet for indoor use and no display (optional with field wiring terminals for indoor use);
- **X-STREAM (X2GK) or X-STREAM Enhanced (XEGK) General Purpose Compact Gas Analyzer:** Table Top or Rack Mount with appliance inlet for indoor use and display (optional with field wiring terminals for indoor use);
- **X-STREAM X100 Compact Gas Analyzer (X100GK):** Table Top or Rack Mount with appliance inlet for indoor use and display (optional with field wiring terminals for indoor use);

Gas analyzer, Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 5.5 - 3A, Class I, Pollution Degree II.

- **X-STREAM (XXF) or X-STREAM Enhanced Field Housing Gas Analyzer (XDF)**: Wall mounting with field wiring terminals, for outdoor use type 4 & IP66 and display;

Gas analyzer, Model: X-STREAM, rated 24Vdc, 2.5A, Class I, Pollution Degree II.

- **X-STREAM (X2GC or X2GK)or X-STREAM Enhanced (XEGC or XEGK)General Purpose Compact Gas Analyzer** Table Top or Rack Mount with 24Vdc in connector and display;
- **X-STREAM Compact Gas Analyzer Core (XCC or XCK):** Table Top or Rack Mount with 24Vdc in

Conditions of Acceptability

- For the X-STREAM Models X2GP, XCA and XEGP and the AC powered versions of X2GK, X2CK, XEGK and X100GK the equipment is supplied with an approved power supply cord set or power supply cord with plug that is acceptable to the authorities in the country where the equipment is to be used. Units supplied without a power cord and that are not permanently connected are considered as component. Component-type units must be provided with a Fire, Mechanical and Electrical enclosure and must be re-evaluated by CSA.

- The plug/connector is used as the disconnected device. The switch for X2GP/XCA/XEGP/XCK/X2GK/XEGK/X100GK is not considered the disconnect device. All units must be provided with a disconnect device.

CLASS 2258-02 PROCESS CONTROL EQUIPMENT – For Hazardous Locations

CLASS 2258-82 PROCESS CONTROL EQUIPMENT – For Hazardous Locations – Certified to U.S. Standards.

X-Stream FD (XFD): Flameproof for Hazardous Locations

Class I, Zone 1, Ex d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Class I, Zone 1, AEx d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Gas analyzer, Model: X-Stream, rated 100-240Vac, 50/60 Hz, 2–1 A. Class I, Pollution Degree II; Type 4 & IP66

Ambient Temperature Range: -30°C to +50°C Maximum internal case pressure = 110kpa

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Appendix

A

A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate:	1714037 (LR 105173)	**Master Contract:**	185562
Project:	2507282	**Date Issued:**	March 14, 2012

XFD-abcdefghijklmnop

a = Language: A, B, C, D or E

b = Ambient Conditions: 1, 2, 3, 4, 5 or 6

c = Instrument: 1, 2, 3, 4, 5, 6 or 7

d = Bench 1: any combination of 2 or 3 alpha-numeric characters

e = Bench 1 – Special Linearization or Calibration: 0, 1, 2, 3, 4 or 5

f = Bench 2: any combination of 2 or 3 alpha-numeric characters

g = Bench 2 – Special Linearization or Calibration: 0, 1, 2, 3, 4 or 5

h = Enclosure: 1, 2, 3, 4, 5 or 6

i = Hazardous Area Options and Special Approvals: B or D

B = CSA Certification

D = CSA Certification with a Breathing Device for Venting (Same Device as option “p”)

j = Input/Output Options: 1, 2, 5 or 6

k = Communication Interface: A, B, C or D

l = Sample Handling: 0, 1, 3, 5 or 7

m = Gas Path Sensors: 0, 1, 2, 3, 4 or 5

n = Gas Path Tubing: A, B, C, D or E

o = Gas Path Fittings: 3, 4, 5 or 6

p = Flame Arrestors: 2, 3, 4, 5, 6, 7 or 8

X-Stream FD (X2FD): Flameproof for Hazardous Locations

Class I, Zone 1, Ex d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Class I, Zone 1, AEx d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Gas analyzer , Model: X-Stream, rated 100-240Vac, 50/60 Hz, 3 - 1.5A, Class I, Pollution Degree II; Ambient Temperature Range: -30°C to +50°C

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A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate: 1714037 (LR 105173) **Master Contract:** 185562

Project: 2507282 **Date Issued:** March 14, 2012

X-Stream FD (X2FD) has same electronics as the X-STREAM General Purpose Gas Analyzer (X2GP) with new Hazardous Locations Enclosure.

X2FD-abcdefghijklmnopqrstuv

a = Language: A, B, C, D, E or F

b = Ambient Conditions: 1, 2, 3, 4, 5 or 6

c = Instrument: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14 or 15

d = Bench 1: any combination of 2 or 3 alpha-numeric characters

e = Bench 1 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

f = Bench 2: any combination of 2 or 3 alpha-numeric characters

g = Bench 2 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

h = Bench 3: any combination of 2 or 3 alpha-numeric characters

i = Bench 3 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

j = Bench 4: any combination of 2 or 3 alpha-numeric characters

k = Bench 4 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

l = Enclosure: 1, 2, 3, 4, 5 or 6

m = Hazardous Area Options and Special Approvals: B or D

B = CSA Certification

D = CSA Certification with a Breathing Device for Venting (Same Device as option “v”)

n = Analog Outputs: 1, 2, 3 or 4

o = Digital Inputs/Relay Outputs: 0, 1 or 2

p = Communication Interface: 0, A, B, C or D

q = Spare: 0

r = Sample Handling: 0, 1, 2, 3, 4, 5 or 6

s = Gas Path Sensors: 0, 1, 2, 3, 4, 5, 6, 7 or 8

t = Gas Path Tubing: A, B, C, D, E, F, G, H or I

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A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate: 1714037 (LR 105173) **Master Contract:** 185562

Project: 2507282 **Date Issued:** March 14, 2012

u = Gas Path Fittings: E, F, G, H, I, J, K or L

v = Flame Arrestors: 2, 3, 4, 5, 6, 7 or 8

X-STREAM FD (XEFD): Flameproof for Hazardous Locations

Class I, Zone 1, Ex d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Class I, Zone 1, AEx d IIB+H2, T3 and/or Class I, Division 2, Groups B, C, and D, T3

Gas analyzer , Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 3 - 1.5A, Class I, Pollution Degree II; Ambient Temperature Range: -30°C to +50°C

X-STREAM FD Enhanced (XEFD) has same electronics as the X-STREAM Enhanced General Purpose Gas Analyzer **(XEF)** with same Hazardous Locations Enclosure as X-STREAM X2FD.

XEFD-abcdefghijklmnopqrstuv

a = Language: A, B, C, D, E, F or G

b = Ambient Conditions: 1 or 4

c = Instrument: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14 or 15

d = Bench 1: any combination of 2 or 3 alpha-numeric characters

e = Bench 1 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

f = Bench 2: any combination of 2 or 3 alpha-numeric characters

g = Bench 2 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

h = Bench 3: any combination of 2 or 3 alpha-numeric characters

i = Bench 3 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

j = Bench 4: any combination of 2 or 3 alpha-numeric characters

k = Bench 4 – Special Linearization or Calibration: 0, 1, 2, 3, 4, 5, A, B, C or D

l = Enclosure: 1, 2, 3 or 4

m = Hazardous Area Options and Special Approvals: B or D

B = CSA Certification

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A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate: 1714037 (LR 105173) **Master Contract:** 185562

Project: 2507282 **Date Issued:** March 14, 2012

D = CSA Certification with a Breathing Device for Venting (Same Device as option "v")

n = Analog Outputs: 1, 2, 3 or 4

o = Digital Inputs/Relay Outputs/Analog Inputs: 0, 1, 2, 5 or A

p = Communication Interface: 0, A or B

q = Advanced Software capabilities: 0, 1, 2 or 3

r = Sample Handling: 0, 1, 2, 3, 4, 5 or 6

s = Gas Path Sensors: 0, 1, 3, 5, 7 or 9

t = Gas Path Tubing: E, F, G, H, I, J, K or L

u = Gas Path Fittings: E, F, G, H, I, J, K or L

v = Flame Arrestors: 2, 3, 4, 5, 6, 7 or 8

X-STREAM FN (XLFN, XXFN, XEFN, XDFN): Non-Incendive for Hazardous Locations

Class 1 Zone 2 Ex nAC IIC T4

Class 1 Zone 2 AEx nAC IIC T4

Class I Div 2 Groups ABCD

-20 °C to +50 °C IP66 Enclosure Type 4X

- **X-STREAM (XLFN) or X-STREAM Enhanced (XEFN)Field Housing Gas Analyzer:**

Gas analyzer, Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 3 - 1.5A, Class I, Pollution Degree II

- **X-STREAM (XXFN) or X-STREAM Enhanced Dual (XDFN) Field Housing Gas Analyzer**:

Gas analyzer, Model: X-STREAM, rated 100-240Vac, 50/60 Hz, 5.5 - 3A, Class I, Pollution Degree II

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 61010-1-04 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements

UL Std No. 61010-1, 2nd Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements

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A.3 CSA Certificate of Compliance

CSA INTERNATIONAL

Certificate:	1714037 (LR 105173)	**Master Contract:**	185562
Project:	2507282	**Date Issued:**	March 14, 2012

CAN/CSA-E60079-0:02 (R2006) - Electric Apparatus for Explosive Gas Atmospheres, Part 0: General Requirements

CAN/CSA-E60079-1:02 (R2006) - Electric Apparatus for Explosive Gas Atmospheres, Part 1: Construction and Verification Test of Flameproof Enclosures of Electrical Apparatus “d”

CAN/CSA-E60079-15:02 (R2006) - Electric Apparatus for Explosive Gas Atmospheres, Part 15: Type of protection "n"

CSA C22.2 No 213-M1987 - Non-Incendive Electrical Equipment for Use in Class I,Division 2 Hazardous Locations

CAN/CSA-C22.2 No. 94-M91 (R2006) - Special Purpose Enclosures

CAN/CSA C22.2 No. 60529:05 - Degrees of protection provided by enclosure (IP Code)

ANSI/ISA-12.00.01-2002 (IEC 60079-0 Mod) - Electric Apparatus for Use in Class I, Zones 0, 1 & 2 Hazardous (Classified) Locations: General Requirements

ANSI/ISA-12.22.01-2002 (IEC 60079-1 Mod) - Electric Apparatus for Use in Class I, Zones 1 Hazardous (Classified) Locations Type of Protection – Flameproof “d”

UL 60079-15:2009 - Electric Apparatus for Explosive Gas Atmospheres, Part 15: Construction, Test and Marking of Type of Protection ’n’ Electrical Apparatus

IEC 60529 Edition 2.1-2001-02 - Degrees of protection provided by enclosure (IP Code)

UL 50 11th Edition - Enclosures for Electrical Equipment

ANSI/ISA 12.12.01-2011 - Non-Incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

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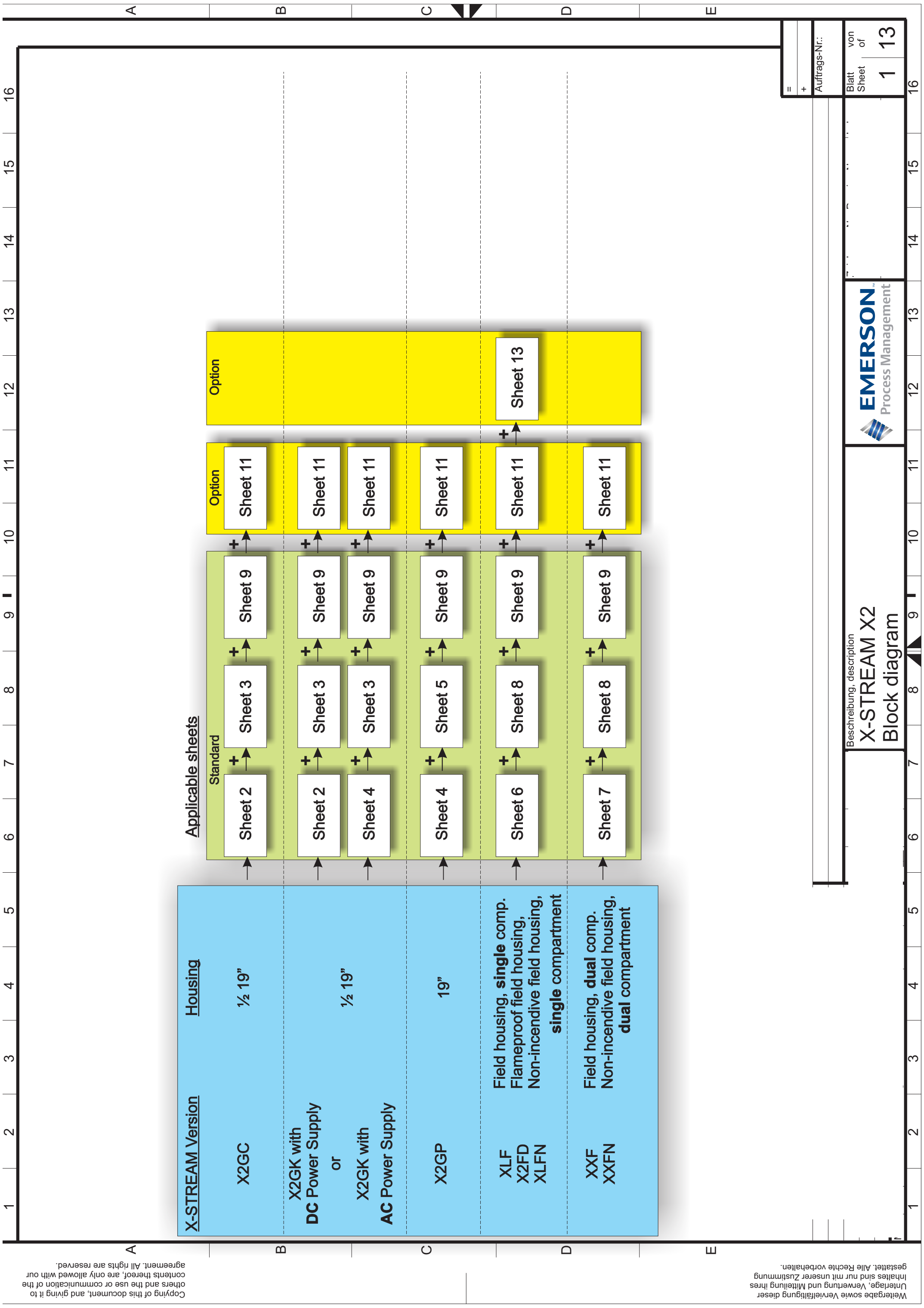
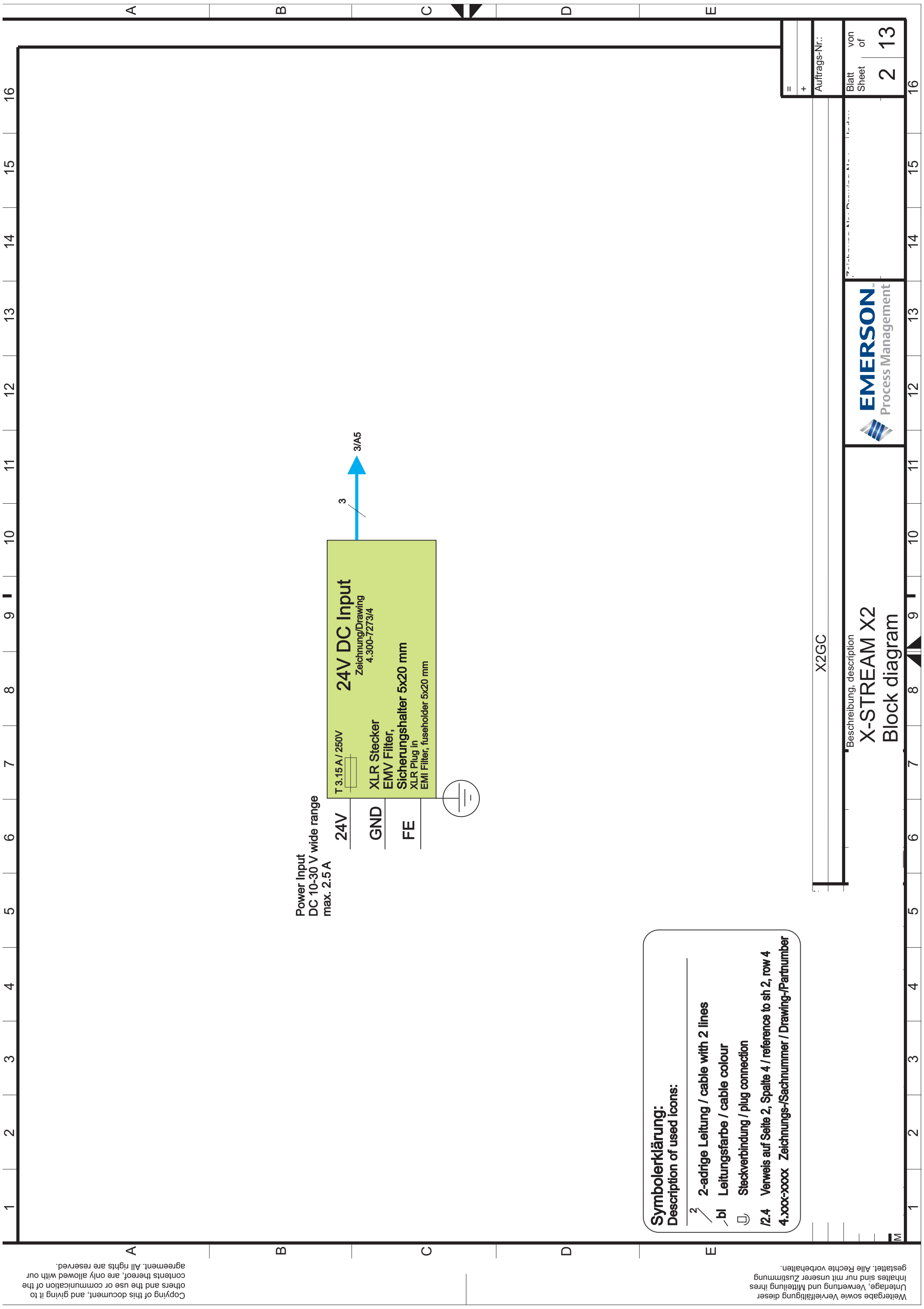
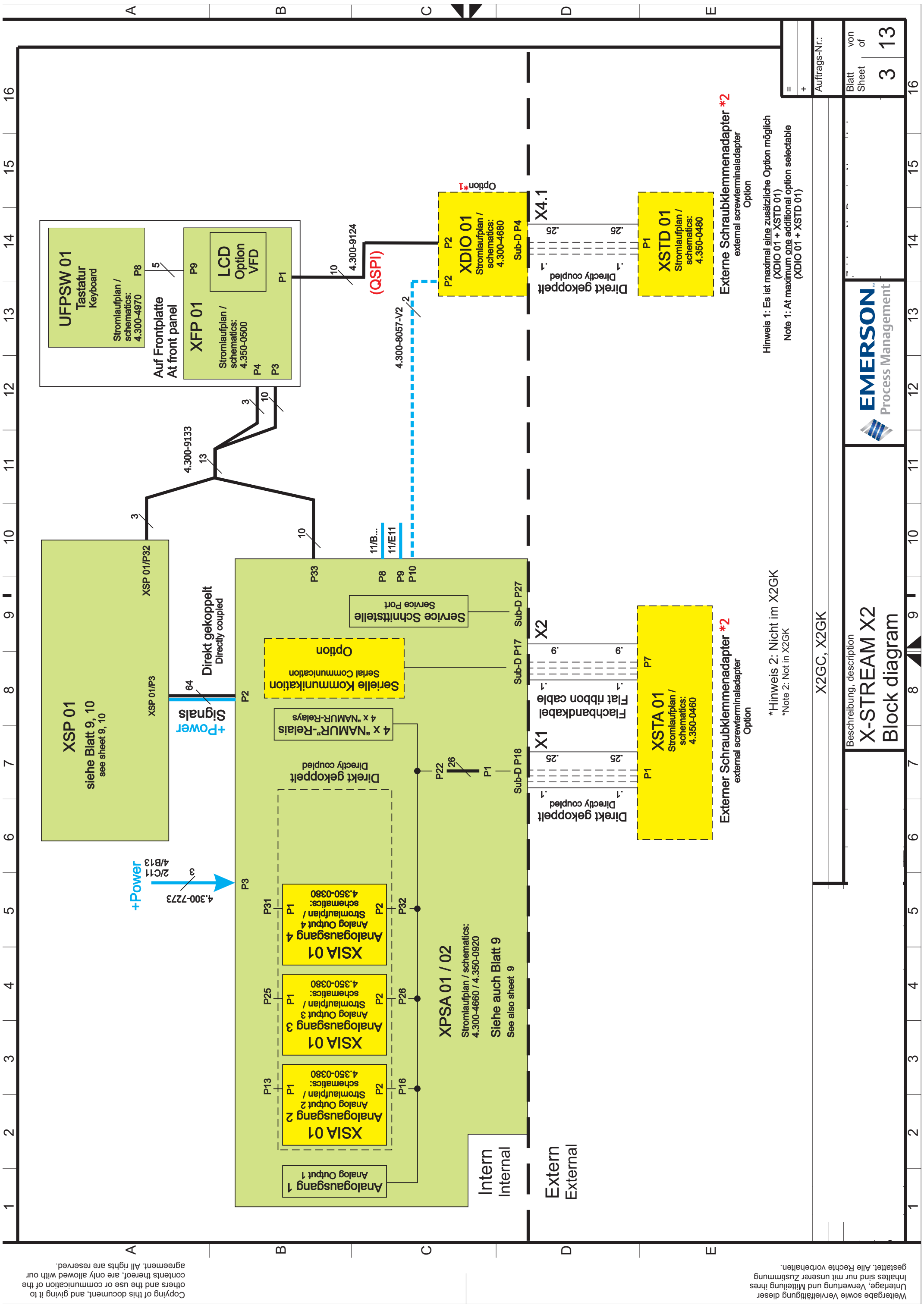
A.4 Block diagram



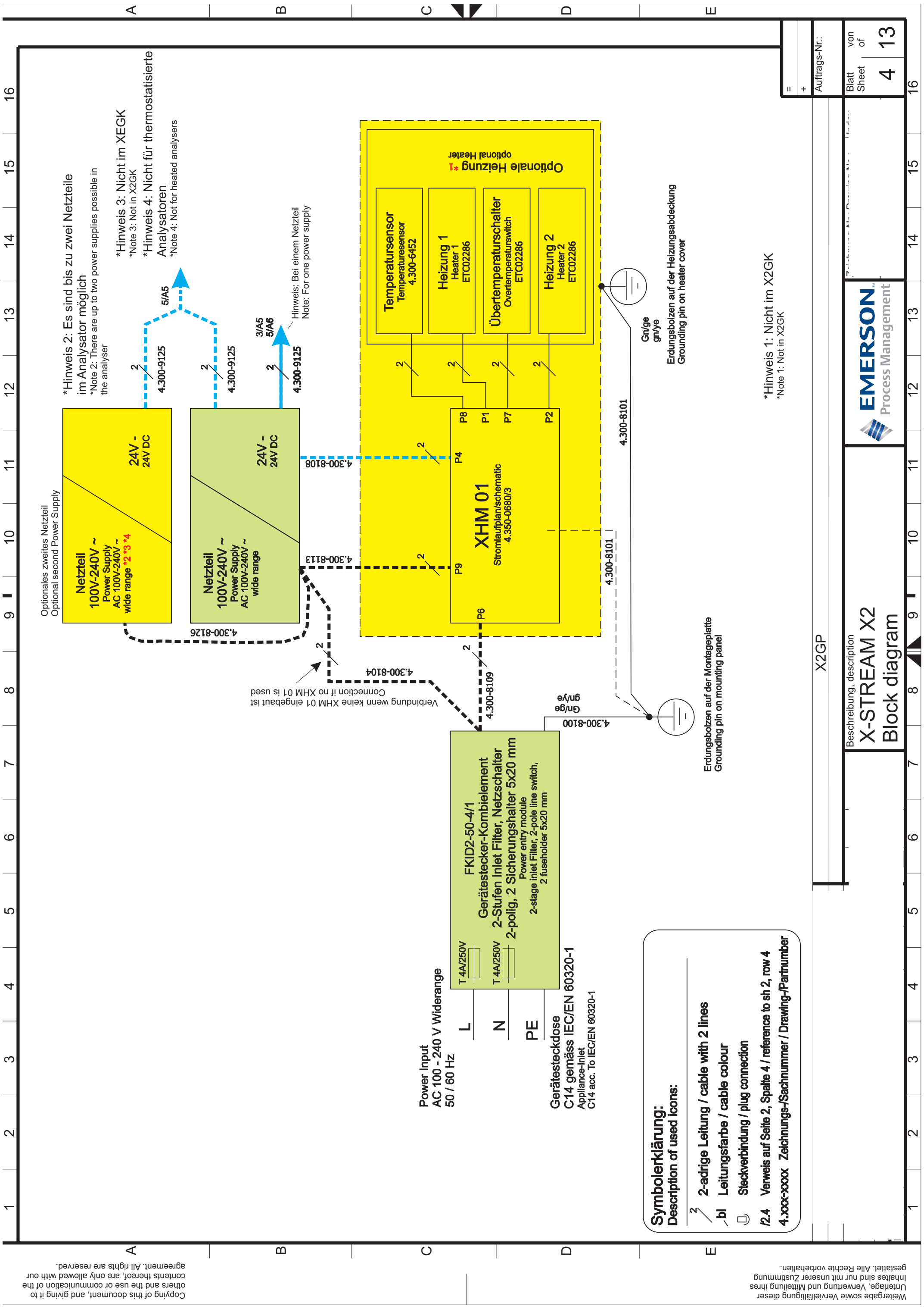
A.4 Block Diagram



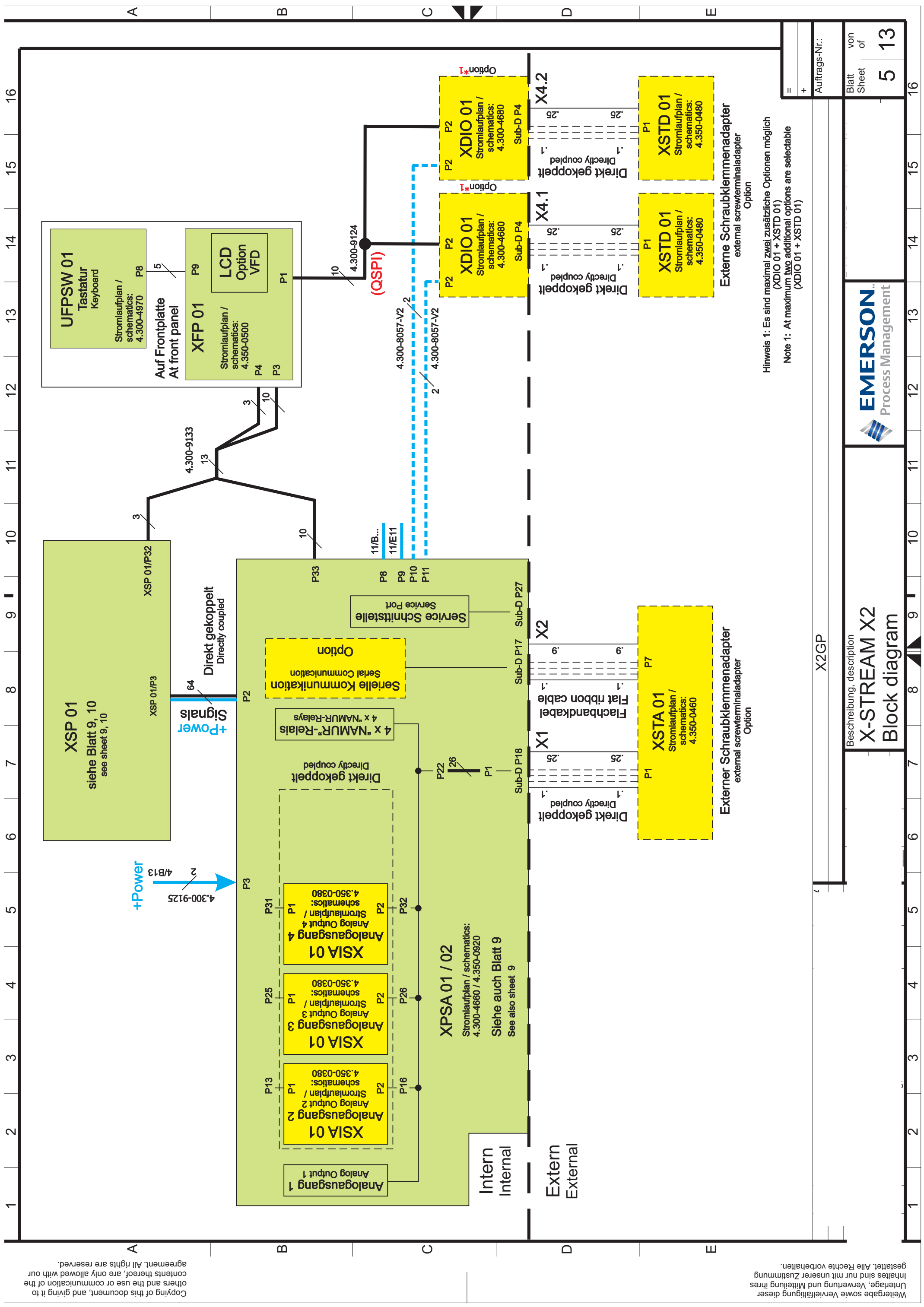
A.4 Block Diagram



A.4 Block Diagram



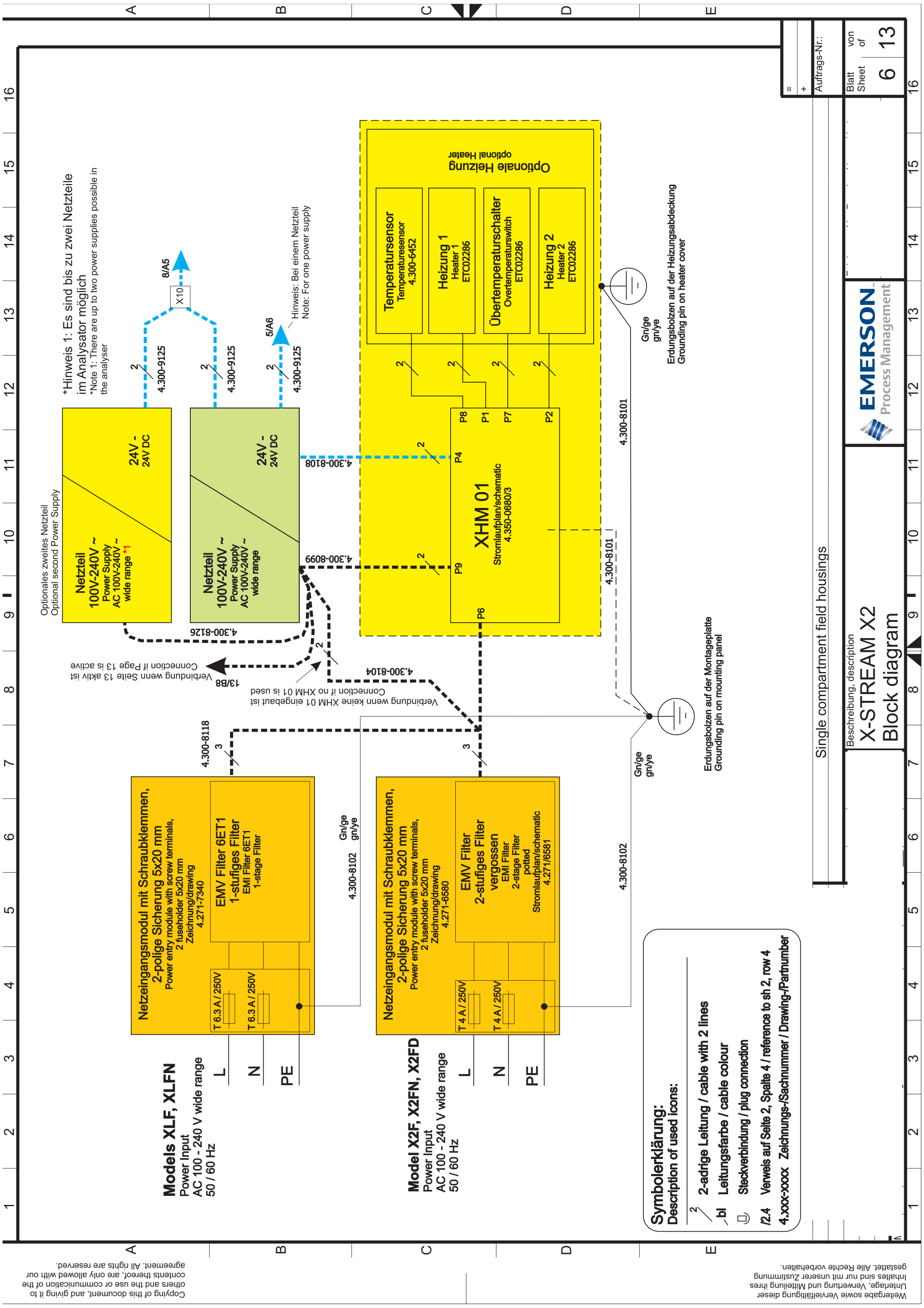
A.4 Block Diagram



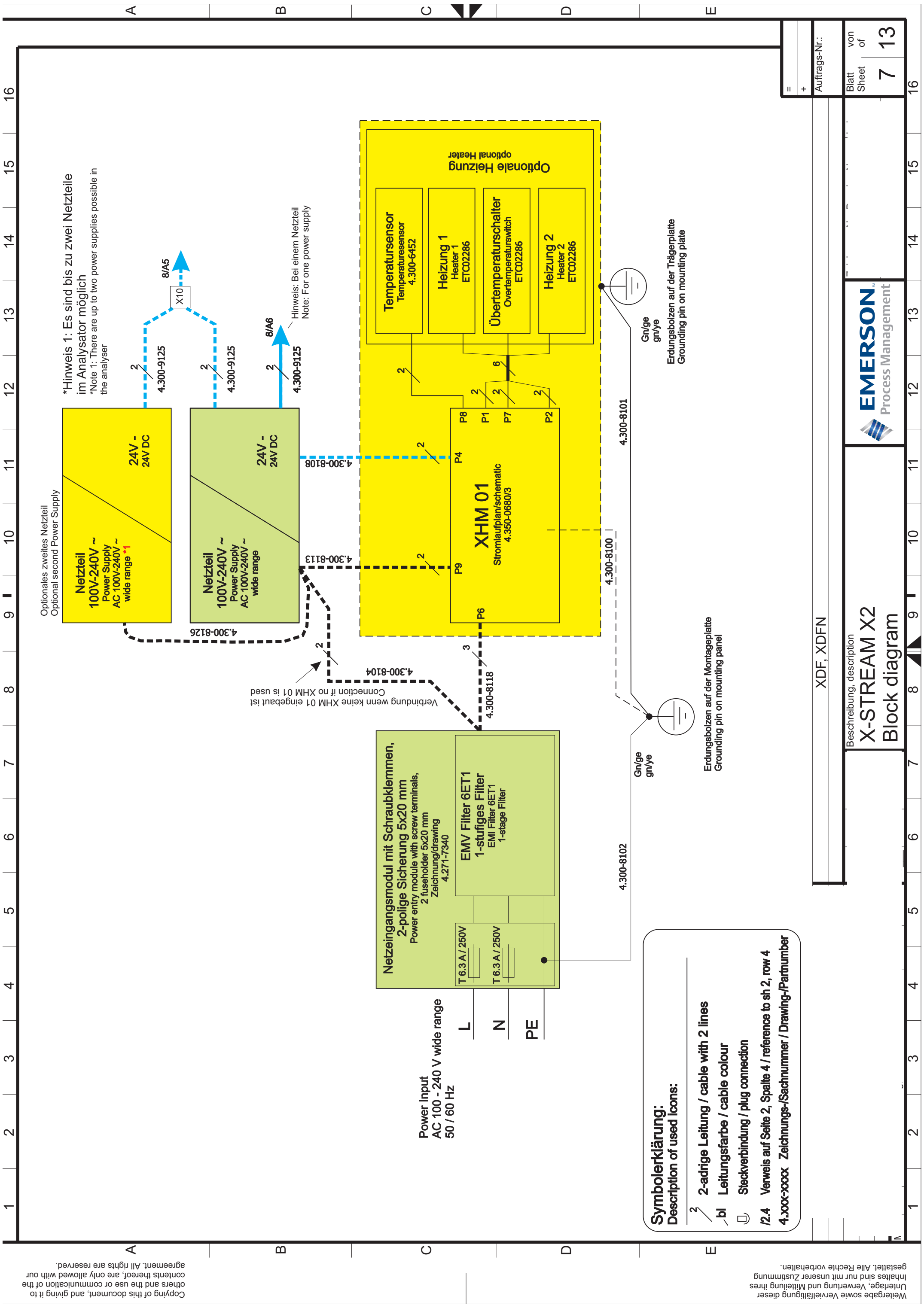
Appendix

A

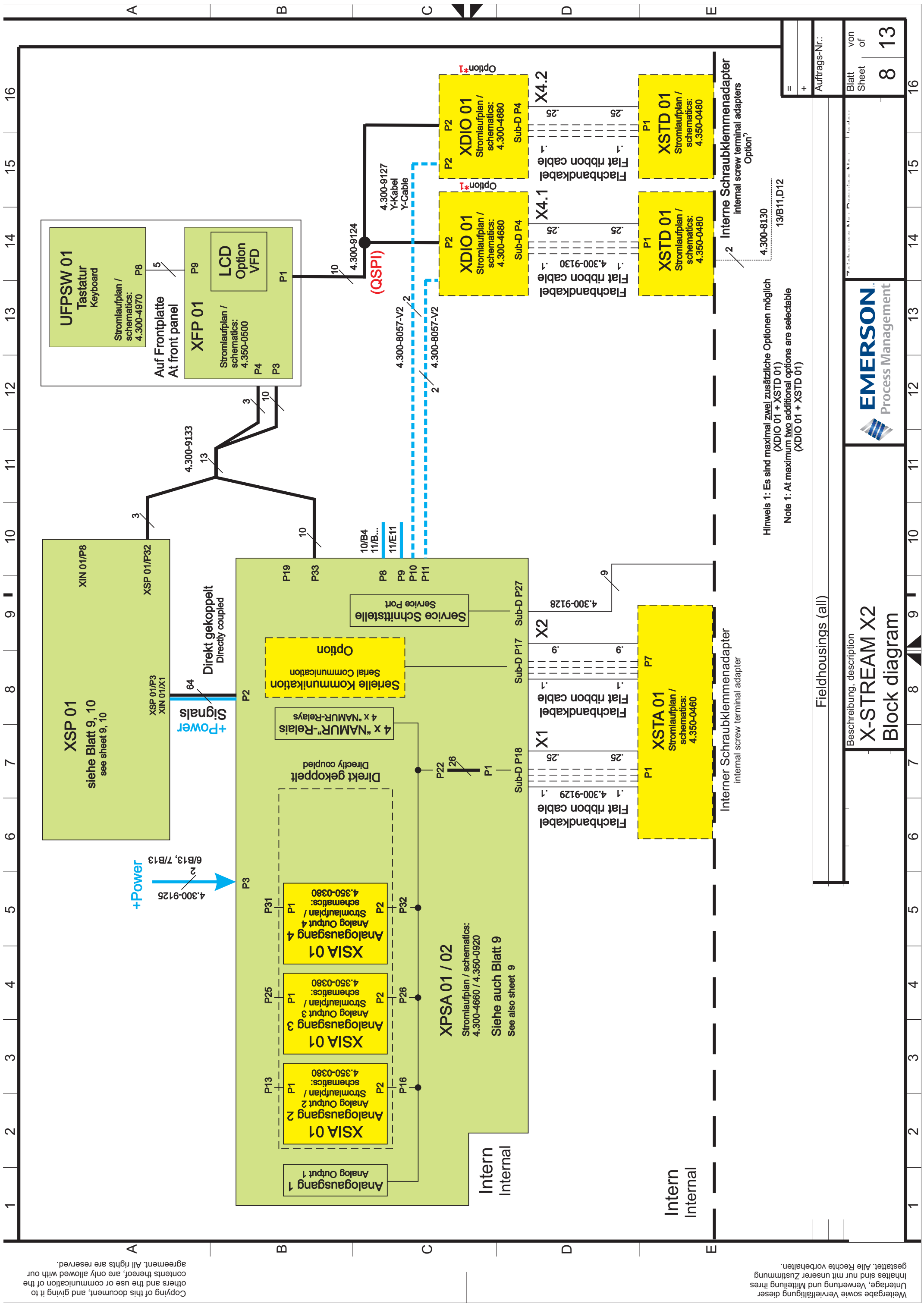
A.4 Block Diagram



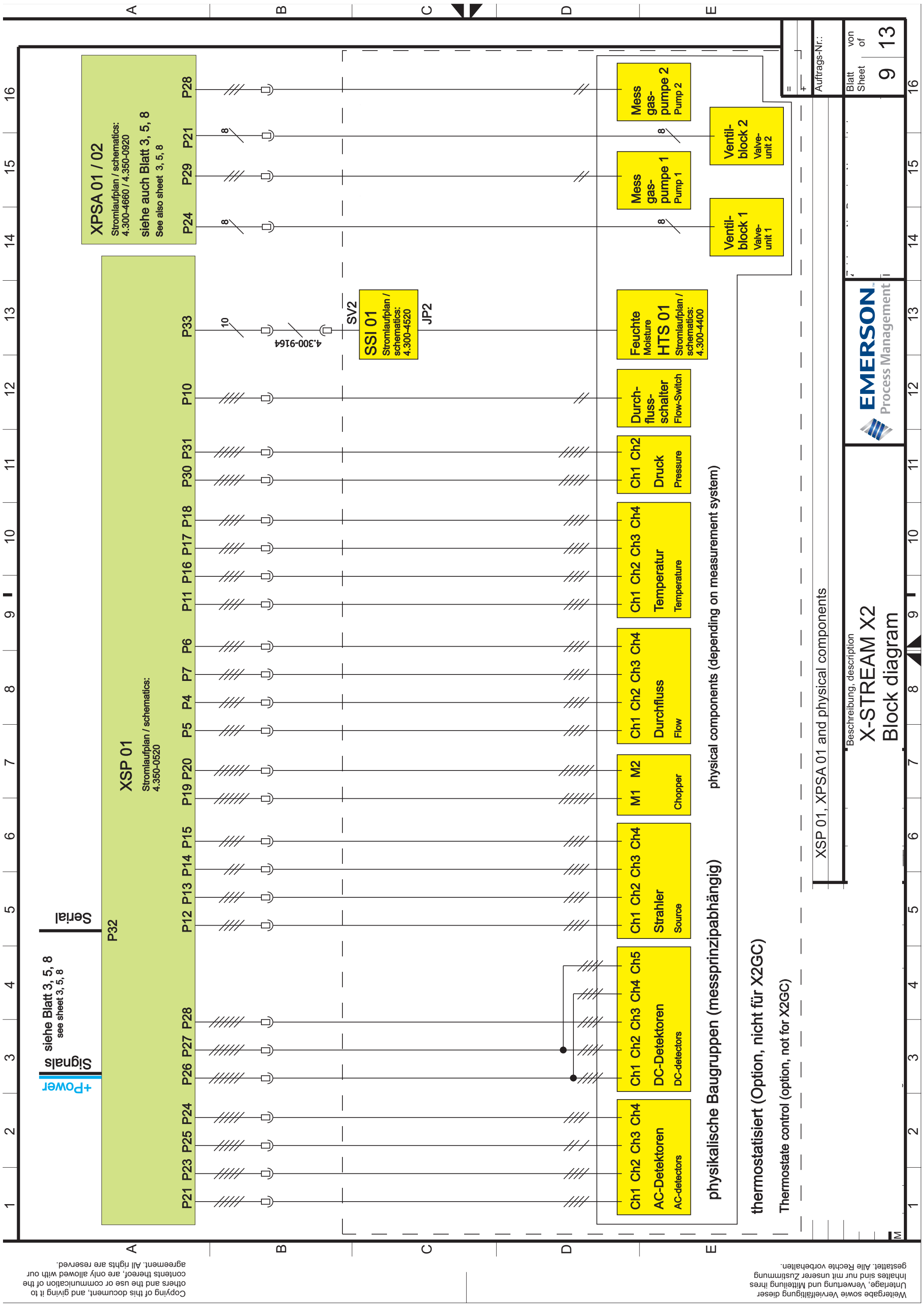
A.4 Block Diagram



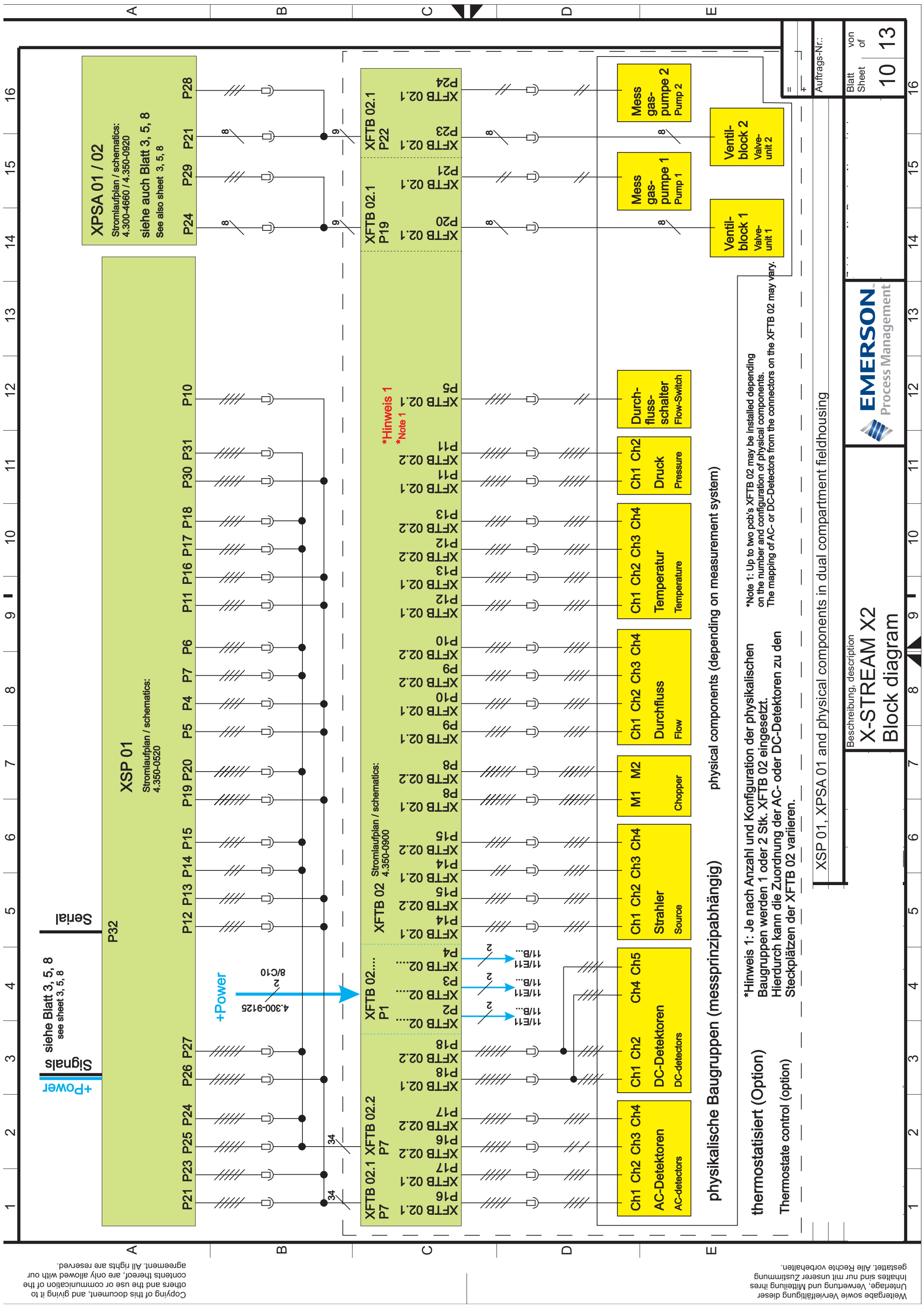
A.4 Block Diagram



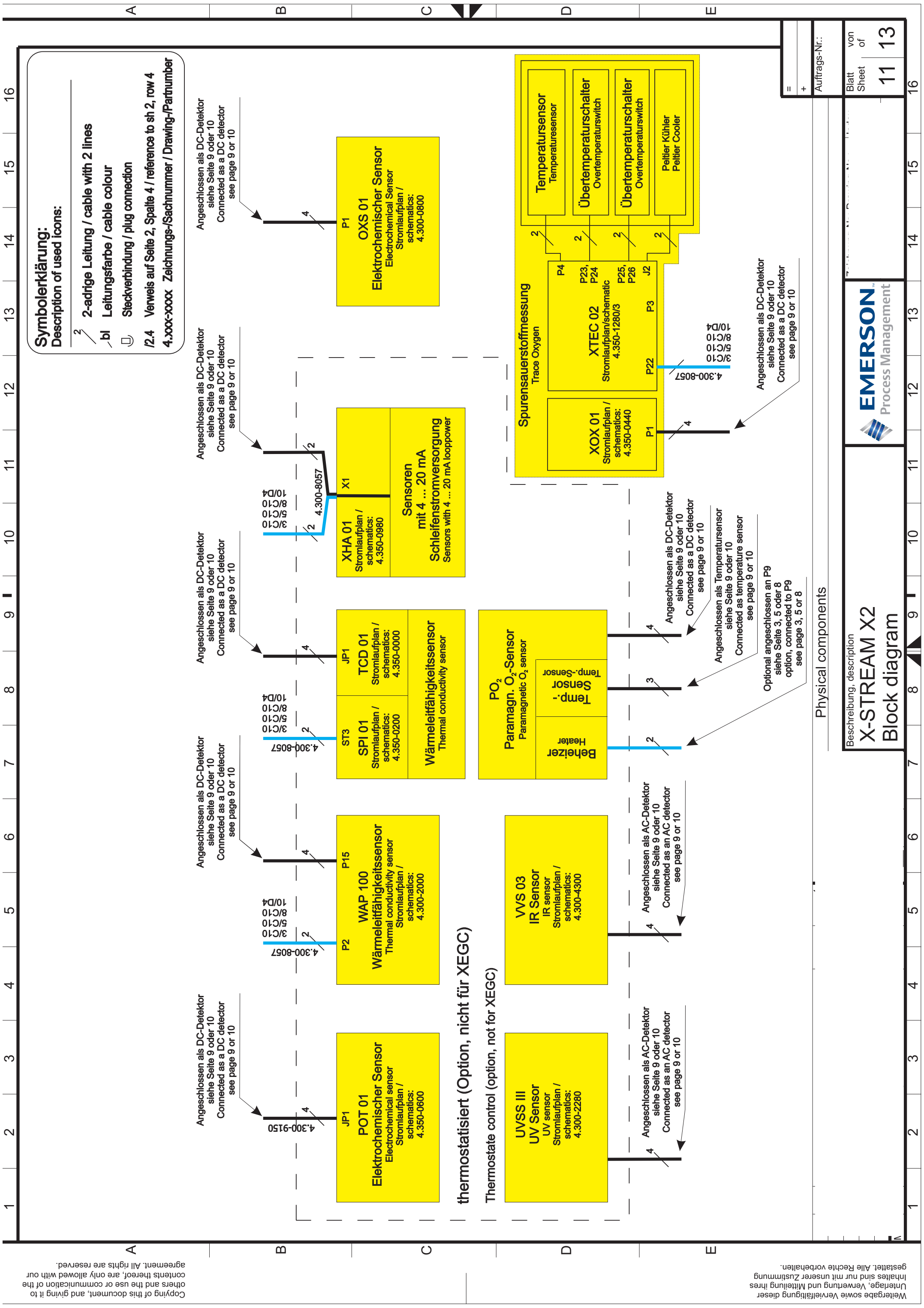
A.4 Block Diagram



A.4 Block Diagram



A.4 Block Diagram



A.4 Block Diagram

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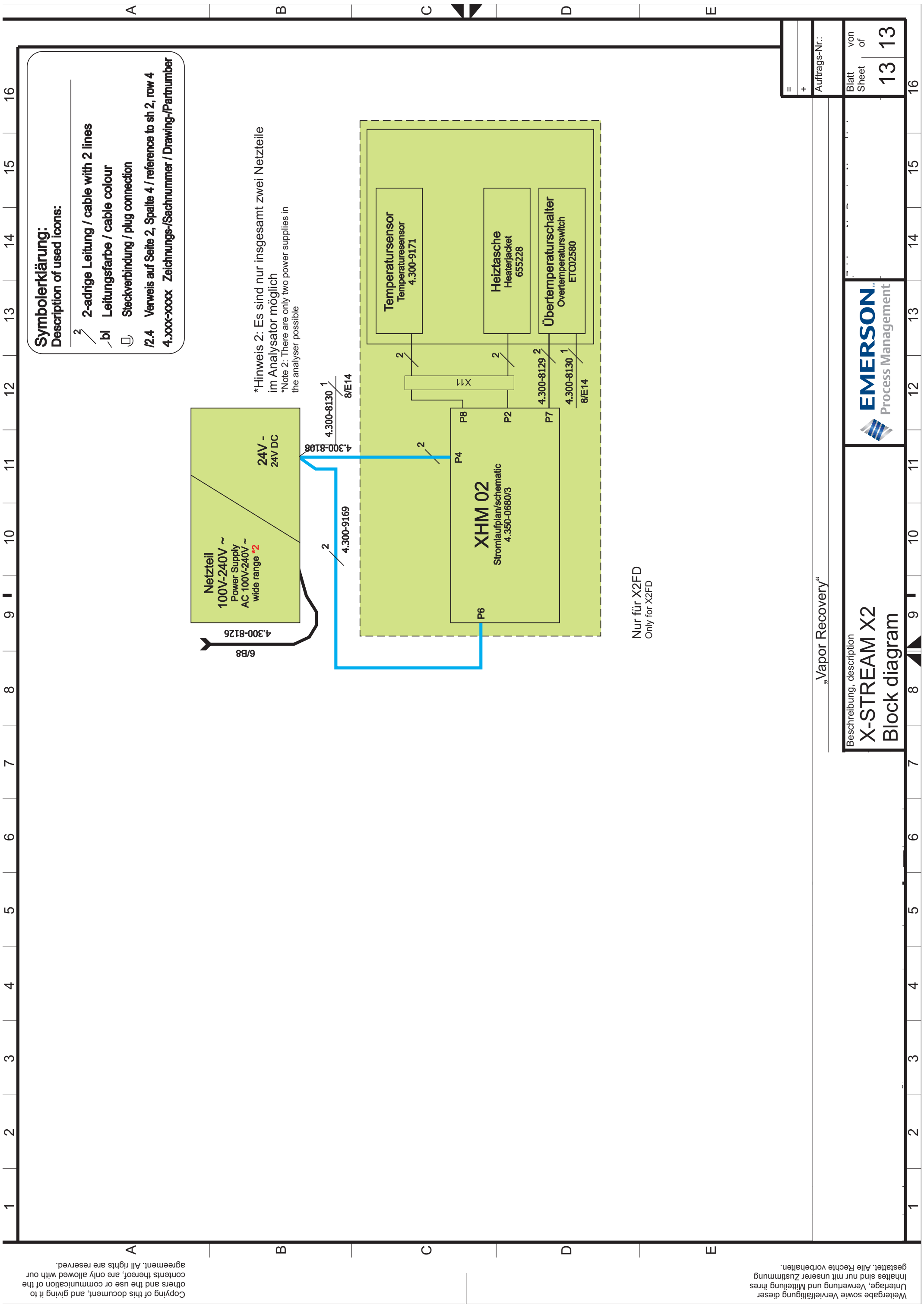
Beschreibung, description
X-STREAM X2
Block diagram

Auftrags-Nr.:

Blatt Sheet 12 von of 13

A.4 Block Diagram



Appendix

A

A.5 Calculation of Water Vapor

A.5 Water Vapor: Relationship of Dewpoint, Vol.-% and g/Nm³

Dewpoint		Content of Water	Water Concentration
° C	° F	Vol. -%	g/Nm³
0	32,0	0,60	4,88
1	33,8	0,65	5,24
2	36,8	0,68	5,64
3	37,4	0,75	6,06
4	39,2	0,80	6,50
5	41,0	0,86	6,98
6	42,8	0,92	7,49
7	44,6	0,99	8,03
8	46,4	1,06	8,60
9	48,2	1,13	9,21
10	50,0	1,21	9,86
11	51,8	1,29	10,55
12	53,6	1,38	11,29
13	55,4	1,48	12,07
14	57,2	1,58	12,88
15	59,0	1,68	14,53
16	60,8	1,79	14,69
17	62,6	1,90	16,08
18	64,4	2,04	16,72
19	66,2	2,16	17,72
20	68,0	2,30	19,01
21	69,8	2,45	20,25
22	71,6	2,61	21,55
23	73,4	2,77	22,95
24	75,2	2,95	24,41
25	77,0	3,12	25,97
26	78,8	3,32	27,62
27	80,6	3,52	29,37
28	82,4	3,73	32,28
29	84,2	3,96	33,15
30	86,0	4,18	35,20
31	87,6	4,43	37,37
32	89,6	4,69	39,67
33	91,4	4,97	42,09
34	93,2	5,25	44,64
35	95,0	5,55	47,35
36	96,8	5,86	50,22
37	98,6	6,20	53,23
38	100,4	6,55	56,87
39	102,2	6,90	59,76
40	104,0	7,18	62,67
42	107,6	8,10	70,95
44	111,2	8,99	79,50
45	113,0	9,45	84,02
46	114,8	9,96	89,20
48	118,4	11,07	99,80
50	122,0	12,04	110,81
52	125,6	13,43	124,61
54	129,2	14,80	139,55
55	131,0	15,55	147,97
56	132,8	16,29	156,26
58	136,4	17,91	175,15
60	140,0	19,65	196,45
62	143,6	21,55	220,60
64	147,2	23,59	247,90
66	150,8	25,80	279,20
68	154,4	28,18	315,10
70	158,0	30,75	356,70
72	161,6	33,50	404,50
74	165,2	36,47	461,05
76	168,8	39,66	527,60
78	172,4	43,06	607,50
80	176,0	46,72	704,20
82	179,6	50,65	824,00
84	183,2	54,84	975,40
86	186,8	59,33	1171,50
88	190,4	64,09	1433,30
90	194,0	69,18	1805,00

Note!
Standard conditions: 273 K (0 °C) and 1013 hPa.
Water concentration calculated at dry standard conditions.

A.6 Declaration of Decontamination

Because of legal regulations and for the safety of Emerson Process Management employees and operating equipment, we need this "**Declaration of Decontamination**", signed by an authorized person, prior to processing your order. Ensure to include it with the shipping documents, or (recommended) attach it to the outside of the packaging.

Instrument details	Analyzer model	
	Serial no.	
Process details	Temperature	
	Pressure	

Please check where applicable, include safety data sheet and, if necessary, special handling instructions!

The medium was used for	Medium and concentration	CAS No.	toxic	harmful	corrosive	flamma-ble	other 1)	harmless
Process								
Process cleaning								
Cleaning of returned parts								

1) e.g. explosive, radioactive, environmentally hazardous, of biological risk, etc.
Describe:

Declaration and Sender Data

We hereby declare that the retumed parts have been carefully cleaned. To the best of our knowledge they are free from any residues in dangerous quantities.

Company

Contact Person / Function

Address

Phone

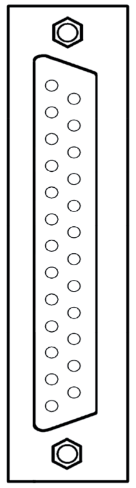
Location, Date

Signature

A.7 Assignment Of Terminals And Sockets

A.7.1 Tabletop & Rack Mount Analyzers

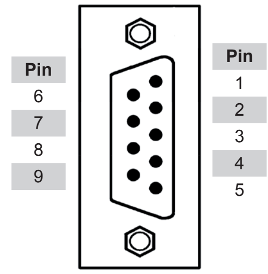
	Signal	Pin
Analog outputs	Channel 1, (+) 4 (0) - 20 mA	1
Analog outputs	Channel 2, (+) 4 (0) - 20 mA	2
Analog outputs	Channel 3, (+) 4 (0) - 20 mA	3
Analog outputs	Channel 4, (+) 4 (0) - 20 mA	4
	unused	5
	unused	6
	unused	7
Relay contacts (Status signals)	Output1 (Failure) NC	8
Relay contacts (Status signals)	Output1 (Failure) NO	9
Relay contacts (Status signals)	Output1 (Failure) COM	10
Relay contacts (Status signals)	Output3 (Off spec) NC	11
Relay contacts (Status signals)	Output3 (Off spec) NO	12
Relay contacts (Status signals)	Output3 (Off spec) COM	13



Pin	Signal	
14	Channel 1, GND	Analog outputs
15	Channel 2, GND	Analog outputs
16	Channel 3, GND	Analog outputs
17	Channel 4, GND	Analog outputs
18	*unused*	
19	*unused*	
20	Output2 (Maintenance request) NC	Relay contacts (Status signals)
21	Output2 (Maintenance request) NO	Relay contacts (Status signals)
22	Output2 (Maintenance request) COM	Relay contacts (Status signals)
23	Output4 (Function check) NC	Relay contacts (Status signals)
24	Output4 (Function check) NO	Relay contacts (Status signals)
25	Output4 (Function check) COM	Relay contacts (Status signals)

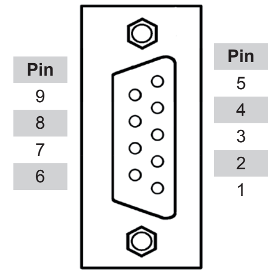
Note!
Configuration of relay contacts as per standard factory setting (NAMUR status signals)

Socket X1 - Analog outputs, relay outputs 1...4
(Assignment of screw terminals adaptor: see XSTA on next page)



Pin no.	MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
1	Common	Common	Common
2	*not used*	*not used*	RXD
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*	RXD0(-)	*not used*
9	D0(-)	TXD0(-)	*not used*

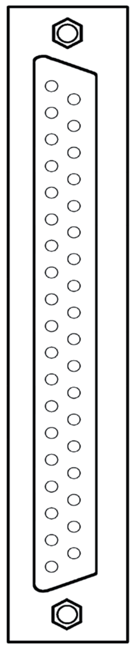
Connector X2 - IOIOI - Serial Modbus interface
(Assignment of screw terminals adaptor: see XSTA on next page)



Pin no.	RS 232
1	Common
2	RXD
3	TXD
4	*not used*
5	Common
6	*not used*
7	*not used*
8	*not used*
9	*not used*

Service Port Socket -
Serial RS 232 interface

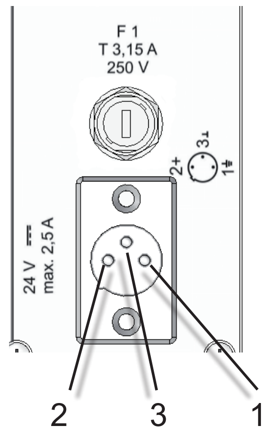
	Signal	Pin
Digital inputs	Input 1	1
Digital inputs	Input 2	2
Digital inputs	Input 3	3
Digital inputs	Input 4	4
Digital inputs	GND for all digital inputs	5
	unused	6
	unused	7
Digital outputs	Output 5 NC	8
Digital outputs	Output 5 NO	9
Digital outputs	Output 5 COM	10
Digital outputs	Output 6, NC	11
Digital outputs	Output 6, NO	12
Digital outputs	Output 6, COM	13
Digital outputs	Output 7, NC	14
Digital outputs	Output 7, NO	15
Digital outputs	Output 7, COM	16
Digital outputs	Output 8, NC	17
Digital outputs	Output 8, NO	18
Digital outputs	Output 8, COM	19



Pin	Signal	
20	Input 5	Digital inputs
21	Input 6	Digital inputs
22	Input 7	Digital inputs
23	Output 9, NC	Digital outputs
24	Output 9, NO	Digital outputs
25	Output 9, COM	Digital outputs
26	Output 10, NC	Digital outputs
27	Output 10, NO	Digital outputs
28	Output 10, COM	Digital outputs
29	Output 11, NC	Digital outputs
30	Output 11, NO	Digital outputs
31	Output 11, COM	Digital outputs
32	Output 12, NC	Digital outputs
33	Output 12, NO	Digital outputs
34	Output 12, COM	Digital outputs
35	Output 13, NC	Digital outputs
36	Output 13, NO	Digital outputs
37	Output 13, COM	Digital outputs

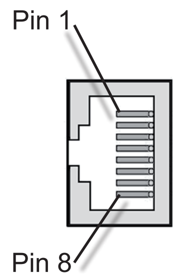
Note!
The configuration illustrated here is that of the first socket, labelled X4.1.
Inputs 8-14 and outputs 14-22, are on the second socket (X4.2), if installed.

Socket X4 - Digital I/O
(Assignment of screw terminals adaptor: see XSTD on next page)



1: ME
2: + 24 V⎓
3: 0 V (⊥)

DC 24 V Input (X2GK)



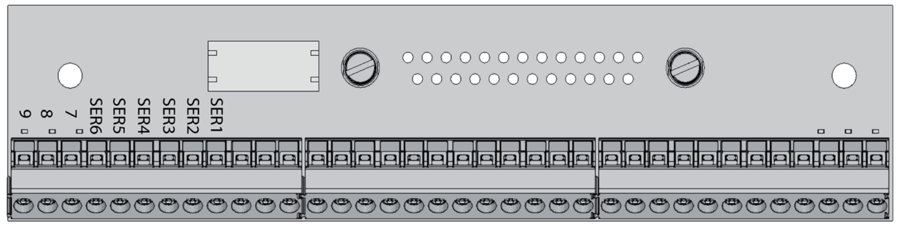
Pin no.	Signal
1	TX+
2	TX-
3	RX+
6	RX-
other	*not used*

Ethernet connector
for Modbus

A.7 Assignment of Terminals and Socket

A.7.2 Field Housings

XSTA: Standard strip with standard and optional signals



Pin	Signal	
P2.1	Channel 1, (+) 4 (0) - 20 mA	Analog Outputs
P2.2	Channel 1, GND	Analog Outputs
P2.3	Channel 2, (+) 4 (0) - 20 mA	Analog Outputs
P2.4	Channel 2, GND	Analog Outputs
P2.5	Channel 3, (+) 4 (0) - 20 mA	Analog Outputs
P2.6	Channel 3, GND	Analog Outputs
P2.7	Channel 4, (+) 4 (0) - 20 mA	Analog Outputs
P2.8	Channel 4, GND	Analog Outputs
P2.9	*not used*	
P2.10	*not used*	
P2.11	*not used*	
P2.12	*not used*	
P3.1	*not used*	
P3.2	*not used*	
P3.3	Output 1 (Failure), NC	Relay Outputs**)
P3.4	Output 1 (Failure), NO	Relay Outputs**)
P3.5	Output 1 (Failure), COM	Relay Outputs**)
P3.6	Output 2 (Maintenance Request), NC	Relay Outputs**)
P3.7	Output 2 (Maintenance Request), NO	Relay Outputs**)
P3.8	Output 2 (Maintenance Request), COM	Relay Outputs**)
P3.9	Output 3 (Out of Spec), NC	Relay Outputs**)
P3.10	Output 3 (Out of Spec), NO	Relay Outputs**)
P3.11	Output 3 (Out of Spec), COM	Relay Outputs**)
P3.12	Output 4 (Function check), NC	Relay Outputs**)
P4.1	Output 4 (Function check), NO	Relay Outputs**)
P4.2	Output 4 (Function check), COM	Relay Outputs**)
P4.3	*not used*	
P4.4		Serial Interface*)
P4.5		Serial Interface*)
P4.6		Serial Interface*)
P4.7		Serial Interface*)
P4.8		Serial Interface*)
P4.9		Serial Interface*)
P4.10		Serial Interface*)
P4.11		Serial Interface*)
P4.12		Serial Interface*)

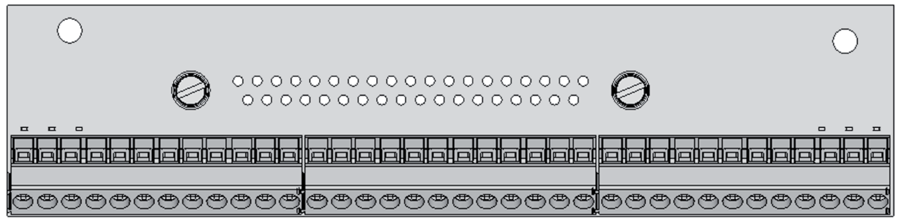
*) See table below

**) Configuration of relay output terminals as per standard factory setting (NAMUR status signals)

Assignment of serial interface terminals

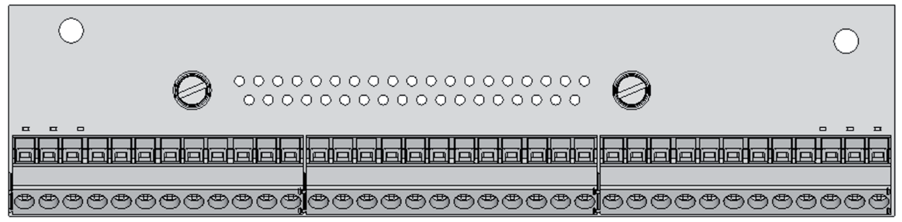
Terminal		MOD 485/ 2 wire	MOD 485/ 4 wire	RS 232
P4.4	*SER1*	Common	Common	Common
P4.5	*SER2*	*not used*	*not used*	RXD
P4.6	*SER3*	*not used*	*not used*	TXD
P4.7	*SER4*	*not used*	RXD1(+)	*not used*
P4.8	*SER5*	D1(+)	TXD1(+)	Common
P4.9	*SER6*	*not used*	*not used*	*not used*
P4.10	*7*	*not used*	*not used*	*not used*
P4.11	*8*	*not used*	RXD0(-)	*not used*
P4.12	*9*	D0(-)	TXD0(-)	*not used*

XSTD: First optional strip with optional 7 Dig Inputs and 9 Dig Outputs



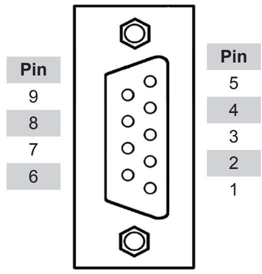
Pin	Signal	
P3.1	Input 1	Digital Inputs
P3.2	Input 2	Digital Inputs
P3.3	Input 3	Digital Inputs
P3.4	Input 4	Digital Inputs
P3.5	Input 5	Digital Inputs
P3.6	Input 6	Digital Inputs
P3.7	Input 7	Digital Inputs
P3.8	GND for Inputs 1-7	Digital Inputs
P3.9	*not used*	
P3.10	Output 5, NC	Digital Outputs
P3.11	Output 5, NO	Digital Outputs
P3.12	Output 5, COM	Digital Outputs
P4.1	Output 6, NC	Digital Outputs
P4.2	Output 6, NO	Digital Outputs
P4.3	Output 6, COM	Digital Outputs
P4.4	Output 7, NC	Digital Outputs
P4.5	Output 7, NO	Digital Outputs
P4.6	Output 7, COM	Digital Outputs
P4.7	Output 8, NC	Digital Outputs
P4.8	Output 8, NO	Digital Outputs
P4.9	Output 8, COM	Digital Outputs
P4.10	Output 9, NC	Digital Outputs
P4.11	Output 9, NO	Digital Outputs
P4.12	Output 9, COM	Digital Outputs
P2.1	Output 10, NC	Digital Outputs
P2.2	Output 10, NO	Digital Outputs
P2.3	Output 10, COM	Digital Outputs
P2.4	Output 11, NC	Digital Outputs
P2.5	Output 11, NO	Digital Outputs
P2.6	Output 11, COM	Digital Outputs
P2.6	Output 12, NC	Digital Outputs
P2.8	Output 12, NO	Digital Outputs
P2.9	Output 12, COM	Digital Outputs
P2.10	Output 13, NC	Digital Outputs
P2.11	Output 13, NO	Digital Outputs
P2.12	Output 13, COM	Digital Outputs

XSTD: Second optional strip with another set of optional 7 Dig Inputs and 9 Dig Outputs



Pin	Signal	
P3.1	Input 8	Digital Inputs
P3.2	Input 9	Digital Inputs
P3.3	Input 10	Digital Inputs
P3.4	Input 11	Digital Inputs
P3.5	Input 12	Digital Inputs
P3.6	Input 13	Digital Inputs
P3.7	Input 14	Digital Inputs
P3.8	GND for Inputs 8-14	Digital Inputs
P3.9	*not used*	
P3.10	Output 14, NC	Digital Outputs
P3.11	Output 14, NO	Digital Outputs
P3.12	Output 14, COM	Digital Outputs
P4.1	Output 15, NC	Digital Outputs
P4.2	Output 15, NO	Digital Outputs
P4.3	Output 15, COM	Digital Outputs
P4.4	Output 16, NC	Digital Outputs
P4.5	Output 16, NO	Digital Outputs
P4.6	Output 16, COM	Digital Outputs
P4.7	Output 17, NC	Digital Outputs
P4.8	Output 17, NO	Digital Outputs
P4.9	Output 17, COM	Digital Outputs
P4.10	Output 18, NC	Digital Outputs
P4.11	Output 18, NO	Digital Outputs
P4.12	Output 18, COM	Digital Outputs
P2.1	Output 19, NC	Digital Outputs
P2.2	Output 19, NO	Digital Outputs
P2.3	Output 19, COM	Digital Outputs
P2.4	Output 20, NC	Digital Outputs
P2.5	Output 20, NO	Digital Outputs
P2.6	Output 20, COM	Digital Outputs
P2.6	Output 21, NC	Digital Outputs
P2.8	Output 21, NO	Digital Outputs
P2.9	Output 21, COM	Digital Outputs
P2.10	Output 22, NC	Digital Outputs
P2.11	Output 22, NO	Digital Outputs
P2.12	Output 22, COM	Digital Outputs

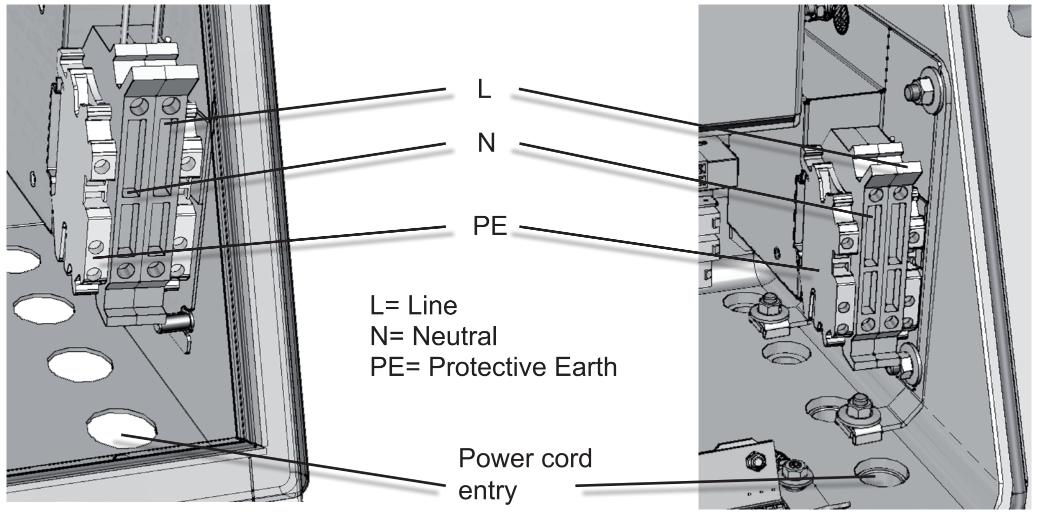
Signal Terminals Strips



Pin no.	RS 232
1	Common
2	RXD
3	TXD
4	*not used*
5	Common
6	*not used*
7	*not used*
8	*not used*
9	*not used*

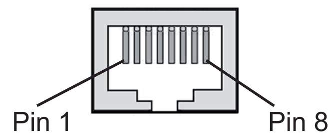
Service Port Connector - Serial RS 232 interface

Note!
Line and neutral terminals with built-in fuse holders



Fieldhousing ***Flameproof (cast) housing***

Power terminals



Pin no.	Signal
1	TX+
2	TX-
3	RX+
6	RX-
other	*not used*

Ethernet connector for Modbus

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