ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

LS4000

Diode laser analyzer

Version for measuring NH_3 and H_2O

Highest precision under harshest conditions

Measurement made easy

Contents

Preface

Content of the operating instruction

This operating instruction contains all the information necessary for the safe and compliant installation, start-up, operation and maintenance of the gas analyzer.

Additional information

Analyzer data sheet

The version of the delivered gas analyzer is described in the "Analyzer data sheet" supplied with the gas analyzer.

DVD-ROM "Software tools and technical documentation"

The DVD-ROM "Software tools and technical documentation" with the following contents is included in the scope of supply of the gas analyzer:

- Software tools
- Operating instructions
- Data sheets
- Technical information
- Certificates

Internet

You will find information on ABB Analytical products and services online at http://www.abb.com/analytical.

Service contact

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

ABB Service,
Telephone: +49-(0)180-5-222 580, Fax: +49-(0)621-381 931 29031,
E-Mail: automation.service@de.abb.com

Symbols and typefaces in the operating instruction

⚠ indicates safety instructions that must be followed when handling the gas analyzer in order to prevent danger to the user.

ⓘ indicates specific information on the operation of the gas analyzer as well as on the use of these operating instructions.

1, 2, 3, … identifies reference numbers in figures.

Safety instructions

Intended use

The gas analyzer is designed for the continuous measurement of the concentration of individual components in a gas mix.

Any other use is not approved.

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

General safety instructions

⚠ **The transmitter unit, receiver unit and junction box must be properly grounded to prevent electrical hazards and disturbances.**

The glass lenses of the transmitter unit and the receiver unit must be protected against mechanical influences.

Safety when installing and connecting

⚠ **The analyzer must only be installed in accordance with regional and national regulations.**

Installation and connection work must only be performed by qualified personnel.

Safety when operating

⚠ **The analyzer must only be operated in accordance with regional and national regulations.**

Safety during maintenance, service and repair work

⚠ **Only genuine spare parts from the manufacturer may be used to replace mechanical, electrical and optical components.**

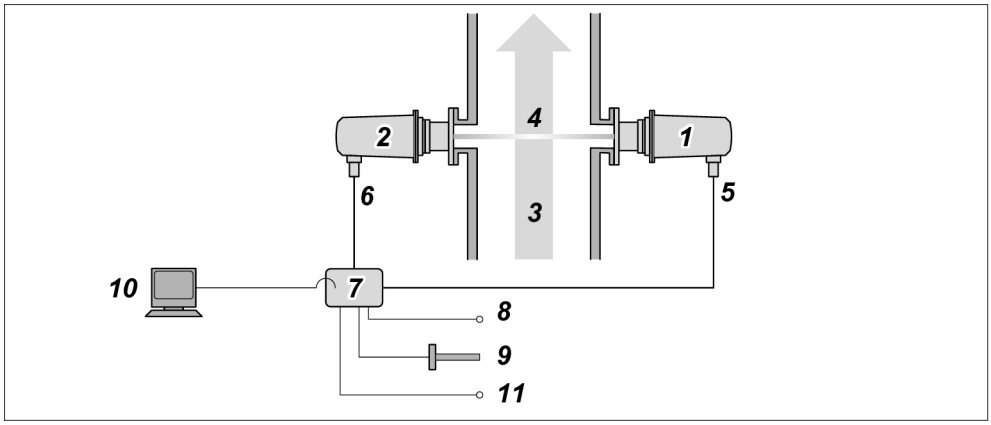
Applied safety standards

Classification	Standard	Degree of protection
Safety of electric devices	EN 61010-1	Protection class I
Safety of laser devices	EN 60825-1	Laser class 1

Description

Design and measuring principle

Analyzer design



No.	Meaning
1	Receiver unit
2	Transmitter unit
3	Process gas
4	Optical path length of the laser beam
5	Connection cable between receiver unit and junction box
6	Connection cable between transmitter unit and junction box
7	Junction box
8	Power supply
9	T/P probe(s)
10	PC
11	Analog and digital outputs

The analyzer consists of a transmitter unit and a receiver unit, which are installed opposite one another on a process line or stack and connected to each other via a junction box.

The following components are connected to the junction box:

- Transmitter unit and receiver unit
- T/P probe(s) for dynamic temperature and pressure correction (depending on application)
- Power supply
- Sensors for analog and digital outputs

A PC can be temporarily connected to the junction box for service purposes.

Analyzer measuring principle

The LS4000 uses the optical measurement method of tunable diode laser absorption spectroscopy (TDLAS), which is based on the fact that gases absorb light of specific wavelengths.

In this method, a configurable laser diode in the transmitter unit emits a laser beam, which passes through the process gas and shines onto the photodetector in the receiver unit. The molecules of the measuring components located in the optical path of the laser beam absorb the laser light, thereby reducing the light intensity at the receiver.

A sophisticated signal algorithm records the measured reduction in light intensity and uses this value to calculate the gas concentration in accordance with the Beer-Lambert law. The influence of temperature and pressure variations is eliminated by a dynamic automatic correction function.

Specifications

Transmitter unit and receiver unit

Specifications	
Dimensions (W x H x D)	118 x 163 x 237 mm
Weight	4.1 kg each
Installation location	Suitable for outdoor use
Ambient temperature	Operation: -20...+55 °C, Storage: -40...+70 °C
Relative humidity	Up to 80 % at max. +31 °C, linearly decreasing to 50 % at +40 °C
Operating voltage	DC 24 V nominal (DC 18...32 V)
Total power consumption	max. 10 W
Housing protection	IP65
IP rating	III

Junction box

Specifications	
Dimensions (W x H x D)	300 x 200 x 155 mm
Weight	4.7 kg
Housing protection	IP65
Installation location	Suitable for outdoor use
Ambient temperature	Operation: -20...+55 °C

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100...240 V ± 10 %; 50...60 Hz
Power consumption	30 VA
IP rating	I
Overvoltage category	II
Degree of pollution	2
Safe isolation	Safety extra-low voltage (SELV) on the low voltage side
Overload protection	Voltage and current limitation

Inputs and outputs (in the junction box)

Specifications	
Analog outputs	Three 4...20 mA outputs (one per measuring component and for transmission), load max. 500 Ω, not insulated
Analog inputs	Two 4...20 mA inputs for dynamic process temperature and pressure correction, load max. 100 Ω, not insulated
Digital outputs	Two outputs: 2 pin with DC/AC 30V/1A NO contacts wired in accordance with the requirements for Class 2 circuits [1)]
Service port	Ethernet 10/100BASE-TX

1) Class 2 circuits are energy-limited circuits with a maximum voltage of AC 30 V or 42 V, a maximum current of 5 A and a maximum power of 100 VA.

Safety and electromagnetic compatibility

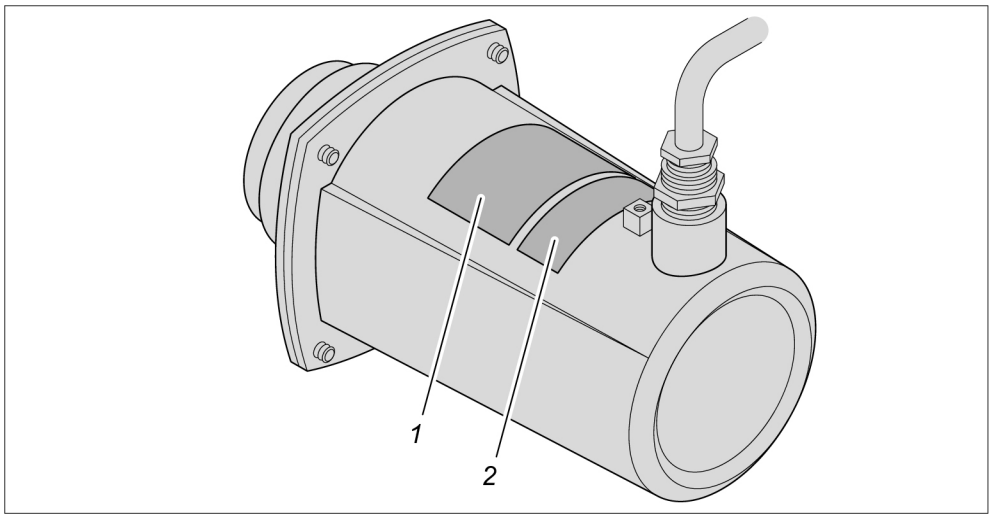
Safety	Tested to EN 61010-1:2010
Safety in accordance with U.S. and Canadian standards – UL, CSA	The LS4000 gas analyzer is certified for use in “General Purpose” environments. It is in line with the CAN/CSA-C22.2 no. 61010-1-12 and UL no. 61010-1 (3rd Edition) standards.
EMC: Interference immunity	Testing in accordance with EN 61326-1:2013 Testing accuracy for industrial sector, fulfills at a minimum the evaluation criteria in accordance with Table 2 of EN 61326-1.
EMC: Emission interference	Testing in accordance with EN 61326-1:2013 Limit Class B for interference field strength and interference voltage is complied with.

The permissible environmental conditions for the transmitter unit and receiver unit may differ from those of the junction box.

In such instances, compliance with the limit values of all modules must be guaranteed by means of a suitable spatial arrangement on site.

Labels

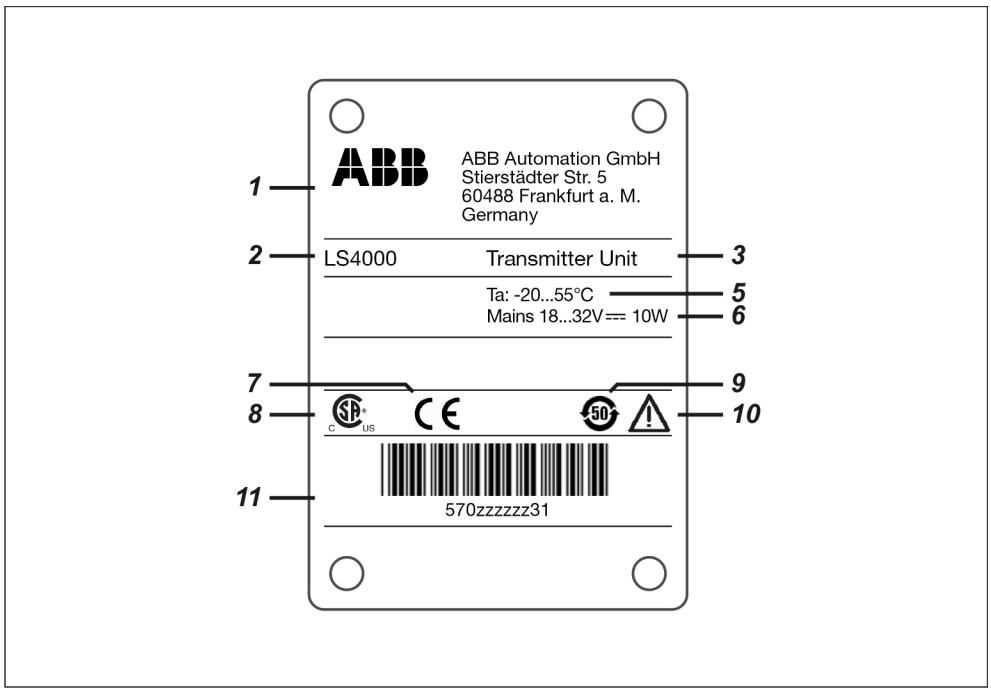
Transmitter unit and receiver unit: position of labels



No.	Meaning
1	Name plate
2	Laser warning

Transmitter unit and receiver unit: deciphering name plates

The transmitter unit and receiver unit are each fitted with a name plate.



No.	Meaning
1	Details of the manufacturer
2	Model name
3	Transmitter unit, receiver unit
5	Permissible ambient temperature for operation

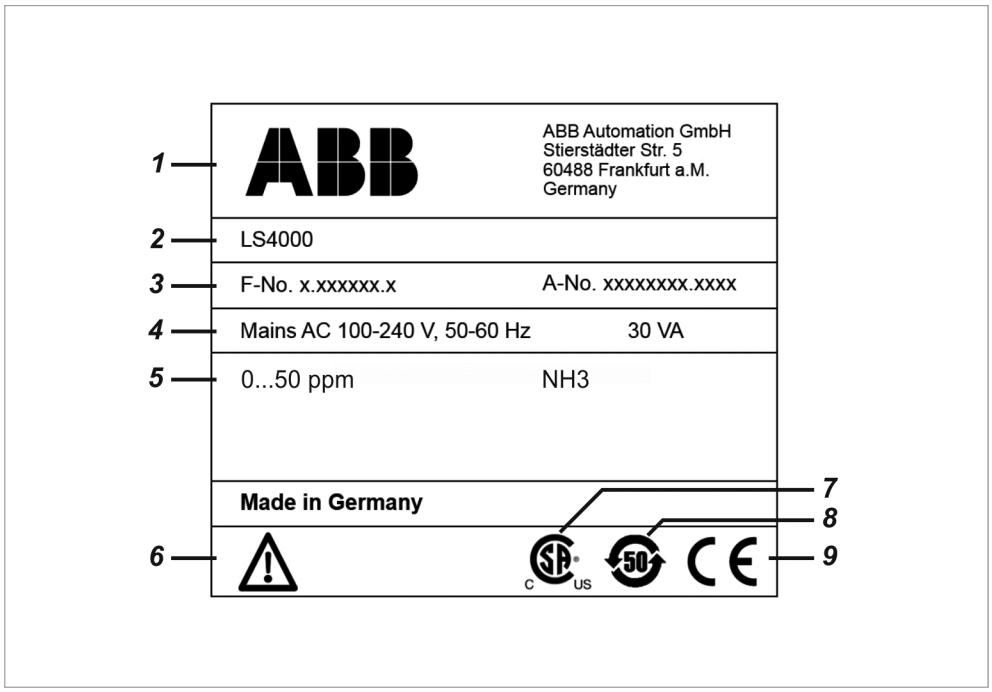
No.	Meaning
6	Supply voltage and power consumption
7	CE mark
8	CSA marking
9	EFUP marking (EFUP = environment friendly use period): 50 years of operating time in accordance with the EU's RoHS Directive without any leaks of substances hazardous to health or the environment under normal conditions of use
10	Symbol: See operating instructions
11	Serial number, displayed as a bar code and in plain text

Transmitter unit and receiver unit: deciphering the laser warning

The transmitter unit and receiver unit are each fitted with a laser warning.

Meaning:
Class I infrared laser beam invisible to the human eye.

Junction box: interpreting the name plate



No.	Meaning
1	Details of the manufacturer
2	Model name
3	F-no. = Manufacturing number, A no. = Order no.
4	Supply voltage and power consumption

No.	Meaning
5	Sample component and measuring range
6	Symbol: See operating instructions
7	CSA marking
8	EFUP marking (EFUP = environment friendly use period): 50 years of operating time in accordance with the EU's RoHS Directive without any leaks of substances hazardous to health or the environment under normal conditions of use
9	CE mark

Preparing for installation

Preparing the system

Shutting down and securing the system

Perform the following steps in accordance with the system documentation:

Step	Procedure
1	Shut down the system in which the laser analyzer is to be fitted.
2	Wait until the system temperature has fallen to its original level.
3	Ensure that the system is no longer pressurized.
4	Secure the system against startup.

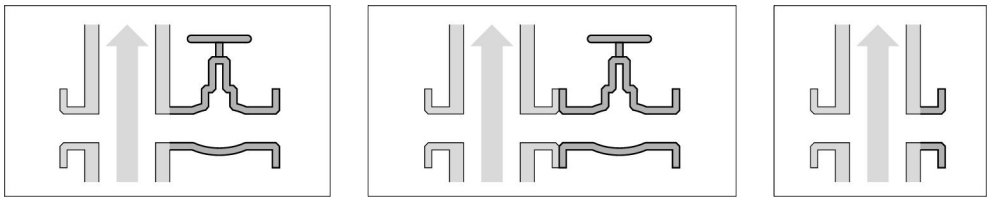
Preparing the installation site

Fitting the installation flanges at the installation site

Installation flanges must be fitted to the process line opposite one another at the laser analyzer installation site.

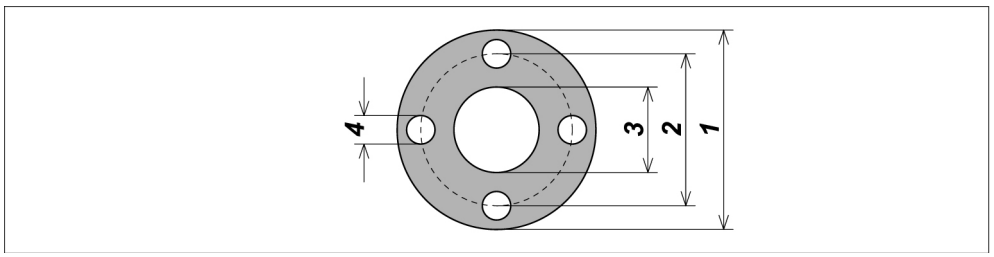
The installation flanges at the installation site can be designed as follows:

- The installation flange forms part of a valve that is welded to the process line.
- The installation flange forms part of a valve that is flanged to the process line.
- The installation flange is welded to the process line.



Dimensions and form of the installation flange

Ensure that the installation flanges have the correct dimensions.

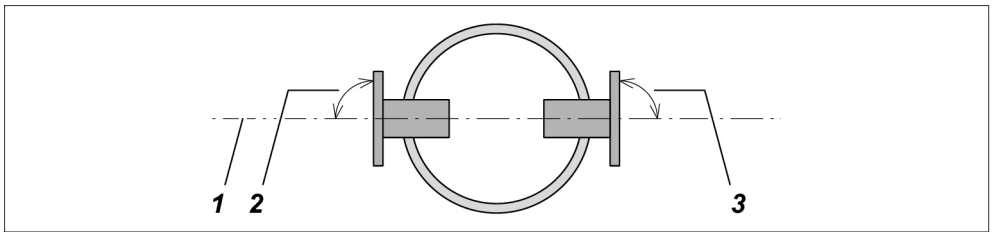


Dimensions of the installation flange with DN 50/PN 10-40 DIN EN 1092-1 Form A (DIN 2526 Form B) – Smooth (machined) sealing surface			
No.	**Meaning**	**Dimension**	**Tolerance**
1	Outer diameter	165 mm	Max. ± 0.5 mm
2	Pitch circle diameter	125 mm	Max. ± 0.3 mm
3	Internal diameter	49.7...65.3 mm	
4	Hole diameter	18 mm	Max. ± 0.2 mm

Installation flange dimensions for ANSI 2 in./150 lbs – Smooth sealing surface (flat face)			
No.	**Meaning**	**Dimension**	**Tolerance**
1	Outer diameter	152.4 mm	Max. ± 0.5 mm
2	Pitch circle diameter	120.6 mm	Max. ± 0.3 mm
3	Internal diameter	49.7...65.3 mm	
4	Hole diameter	19 mm	Max. ± 0.2 mm

Parallel installation flanges

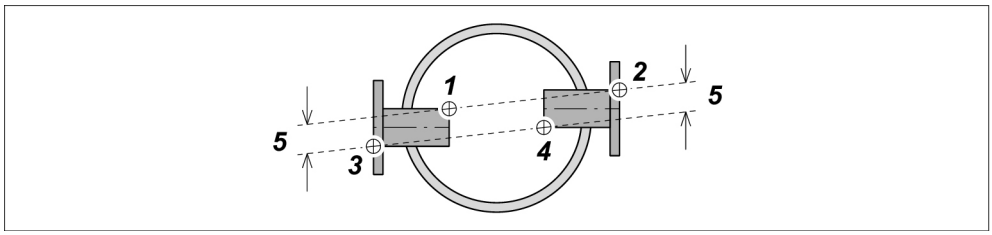
Ensure that the installation flanges are as parallel to one another as possible.



No.	Meaning	Tolerance
1	Installation flange symmetry axes	
2	90° to the axle of the installation flange for the transmitter unit	Max. ± 1.5°
3	90° to the axle of the installation flange for the receiver unit	Max. ± 1.5°

Installation flange offset

To the greatest degree possible, ensure that the orifice installation flanges are not offset.



No.	Meaning	Dimension
1-2	Imaginary connection lines between the transmitter unit and the receiver unit	
3-4		
5	Clearance for installation flanges DN 50 and ANSI 2 in.	Min. 40 mm

Installing blind flanges

Once the installation flanges are fitted, it is advisable to close them with blind flanges until the analyzer is installed.

Approving start of installation

If...	then...
all values are within the tolerancerange	the installation process can be started.
one or more values are outside the tolerance range	the laser analyzer must not be installed.

Process purging

Ensuring purging

Process purging is a continuous purging process used to protect the optical surfaces (lenses) against the build-up of dirt. This process also cools the transmitter and receiver units.

The purging medium is connected to the purging flange and flows into the process, where it mixes with the process gas.

Ensure that a purging flange is fitted for both the transmitter unit and the receiver unit.

Ensuring purge air monitoring

Ensure that the purge air can be monitored. Failure of the purging process can result in irreversible damage to the lenses and cause the transmitter and receiver units to overheat.

Checking purging medium requirements

The following are suitable for use as purging fluids, depending on the application (see data sheet):

- Compressed air or
- Nitrogen

Compressed air quality: dry and oil-free (in accordance with ISO 8573.1, Class 2-3)

Recommended pressure: typically around 25 % above the process pressure.

Recommended flow rate: 20–100 l/min.

If...	**then...**
all requirements are met	the receiver unit and the transmitter unit can be installed.
one or more of the requirements are not met	the receiver unit and the transmitter unit must not be installed.

Purging after installation

To avoid damage to the parts of the gas analyzer affected by the process gas, process purging should be commissioned right after the gas analyzer is installed.

Scope of supply and delivery

Unpacking devices and accessories

Unpack all parts included in the scope of delivery.

Identifying devices and accessories

Ensure that all delivered parts match your order.

Quantity	Designation
1	Transmitter unit with connection cable and protective cap for the lens
1	Receiver unit with connection cable and protective cap for the lens
1	Junction box, power supply unit fitted, cable glands pre-installed
1	Ethernet adapter
2	Purging flanges with seals and fastening clips (as per the order)
1	Analyzer data sheet (in the junction box)
1	Operating Instruction
1	DVD-ROM "Software tools and technical documentation"
	Accessories included as per customer order

Keeping or disposing of packaging material

Keep the transport packaging of the transmitter unit and receiver unit for any possible required transport in the future. Keep the yellow protective caps of the lenses for service purposes. Dispose of the remaining packaging material in accordance with local regulations.

Final check

Finally, check that all parts are complete and in perfect condition.

If...	then...
all parts are in perfect condition	the installation process can be started.
one or more parts are missing or are not in perfect condition	the laser analyzer must not be installed.

Laying out tools and support materials

Laying out tools

Lay out the following tools:

Quantity	Tool	Size
1	Spanner	13 mm
1	Spanner	16 mm
2	Spanner	24 mm
1	Slot screwdriver	3 mm or 4 mm
1	Slot screwdriver	6.5 mm
1	Phillips screwdriver	Phillips No. 2
1	Allen key	5 mm

Laying out support materials

Lay out the following support materials:

Quantity	Tools
1	Laser alignment tool (optional)

Determining cable runs and line runs

Determining cable runs and line runs

The cable runs must meet the following requirements:

- No crossing of walkways
- No risk of mechanical stress
- No chemical or corrosive influences
- No extreme temperature effects
- Possibility of secure cable attachment

Laying out cables and lines

Lay out all cables and lines for connecting the devices.

Select the cable lengths and line lengths according to the conditions in the area.

For details of cable specifications, see Observing cable specifications (see page 38).

Requirements for cable clips and line brackets

The cable clips and line brackets must meet the following conditions:

- They must allow the cables and lines to be laid securely.
- It must be possible to open the cable clips and line brackets to allow the cables and lines to be removed temporarily for calibration of a separate calibration set or for servicing.

Installing components

Option: Installing the insertion tubes

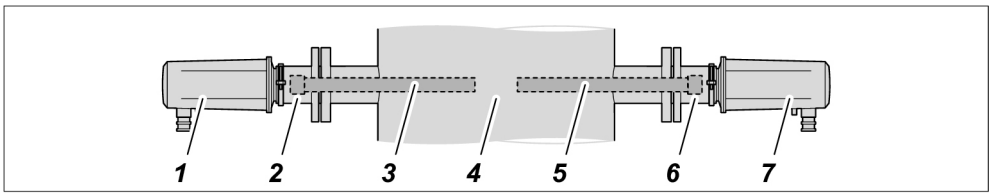
Providing an overview

When must insertion tubes be installed?

If...	then...
the measuring section through the process does not allow for clear laser transmission (e.g. due to high dust load)	insertion tubes must be installed.
the measuring path through the process ensures proper laser light transmission	no insertion tubes must be installed.

Insertion tubes cannot be installed in conjunction with isolation flanges.

Providing an overview

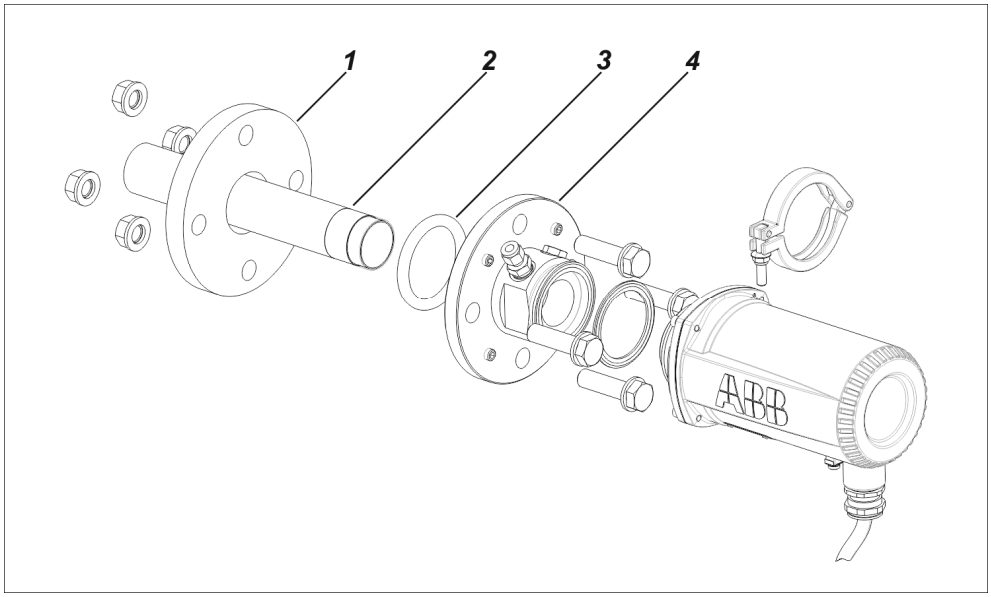


No.	Meaning
1	Transmitter unit
2	Purging flange
3	Insertion tube
4	Process
5	Insertion tube
6	Purging flange
7	Receiver unit

Installing insertion tubes

Installing insertion tubes

The installation steps for the insertion tubes are identical for the transmitter unit and the receiver unit.



No.	Meaning
1	Installation flange
2	Insertion tube
3	Purging flange O-ring
4	Purging flange

Install the insertion tubes as follows:

Step	Procedure
1	Screw the insertion tube ***2*** into the purging flange ***4*** until it stops.
2	Insert the purging flange O-ring ***3*** between the installation flange ***1*** and the purging flange ***4*** into the groove of the purging flange.
3	Install the purging flange ***4*** on the installation flange ***1***.

Option: Installing the isolation flange

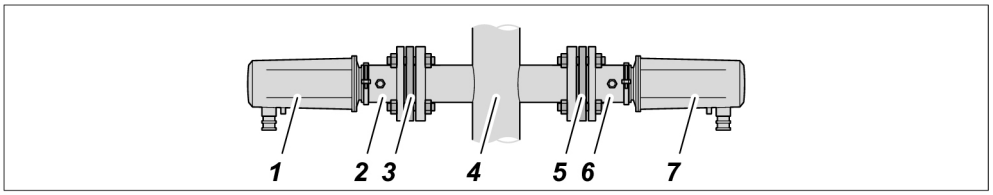
Providing an overview

When must isolation flanges be installed?

If...	then...
the pressure in the process exceeds the maximum allowable pressure on the transmitter unit and the receiver unit (1.5 bar absolute)	the isolation flange must be installed.
the pressure in the process is below the maximum allowable pressure (1.5 bar absolute) on the transmitter unit and the receiver unit	the isolation flanges do not have to be installed.

Isolation flanges cannot be installed in conjunction with insertion tubes.

Providing an overview



No.	Meaning
1	Transmitter unit
2	Purging flange
3	Isolation flange
4	Process
5	Isolation flange
6	Purging flange
7	Receiver unit

Follow the safety information

Safety instructions for handling an isolation flange

⚠ **The isolation flange is tested for use as an accessory together with certified pressure equipment. It meets the requirements of the European Directive 2014/68/EC (Pressure Equipment Directive).**

Note the test report included with the isolation flange!

⚠ **The isolation flange must not be exposed to any kind of shock! The isolation flange must not be dropped! The window must not be damaged!**

The flange surface on the process side must not be damaged! Scratches, in particular those in a radial direction, affect the seal integrity of the connection to the installation flange.

The factory installed purge gas connection (Swagelok® connection) must not be loosened or replaced!

The fixing screws of the retaining ring for the window must not be loosened!

The surface of the installation flange must be level and must not be damaged or deformed! Otherwise, the seal integrity of the connection with the isolation flange cannot be guaranteed!

⚠ **The isolation flange must not be installed,**

- **If it has been exposed to any kind of shock**
- **If it has been dropped**
- **If it has been exposed to temperatures or pressures above the permitted range**
- **If the window has scratches or cracks or chips**
- **If the flange surface on the process side is damaged**
- **If the isolation flange flat gasket is damaged**
- **If the surface of the installation flange is damaged!**

If the isolation flange is damaged, it must be sent to the manufacturer for repair or reprocessing.

⚠ **The user is responsible for making sure that the materials of the isolation flange and the isolation flange flat gasket are compatible with the process gas.**

Improper use may lead to corrosion or erosion of the material, and thus lead to weakening of the material.

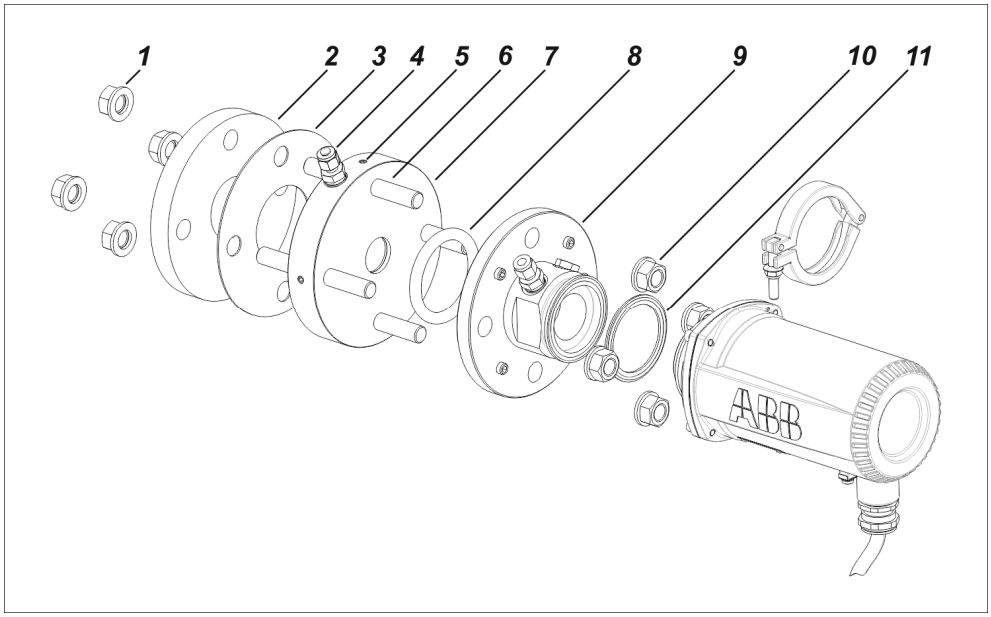
In particular, oxidation processes or high-temperature processes with high oxygen concentrations can impair the stability and thus the seal integrity of the isolation flange flat gasket.

The isolation flange flat gasket is made of novaphit® SSTCTA-L, a material manufactured by Frenzelit Werke GmbH.

Installing the isolation flange

Installing the isolation flange

The installation steps for the isolation flange are identical for the transmitter unit and the receiver unit.



No.	Meaning
1	M16 fastening nuts with washers (4 pieces each)
2	Installation flange
3	Isolation flange flat gasket
4	Purge gas connection (1/4 inch Swagelok® connection)
5	Locking screws (4 pieces)
6	Threaded rods (4 pieces)
7	Isolation flange
8	Purging flange O-ring
9	Purging flange
10	M16 fastening nuts with washers (4 pieces each)
11	Purging flange flat gasket

Install the isolation flanges as follows:

Step	Procedure
1	Before installing: Adjust the position of the threaded rods ***6*** screwed into the isolation flange to the thickness of the installation flange and of the purging flange. If necessary, loosen the locking screws that have been loosely screwed in to do so ***5***.
2	Insert the isolation flange flat gasket ***3*** between the installation flange ***2*** and the isolation flange ***7***.

Step	Procedure
3	Install the isolation flange ***7*** with the fastening nuts and washers ***1*** on the installation flange ***2***. The retaining ring for the window in the isolation flange must point towards the installation flange.
4	Insert the purging flange O-ring ***8*** between the isolation flange ***7*** and the purging flange ***9***.
5	Install the purging flange ***9*** with the fastening nuts and washers ***10*** on the isolation flange ***7***.
6	Tighten the four locking screws ***5***.
7	For the purge gas supply, connect a pipe with an 8 mm outside diameter to the purge gas connection ***4*** (1/4 inch Swagelok® connection).

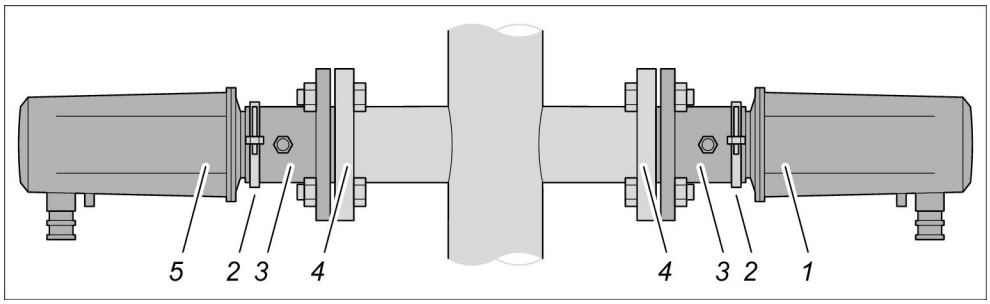
Tightening fastening nuts

Tighten all fastening nuts after assembly at intervals of 24, 48 and 72 hours, in order to compensate for the lingering tension release in the material of the isolation flange flat gasket.

Installing the purging flanges

Providing an overview

Providing an overview



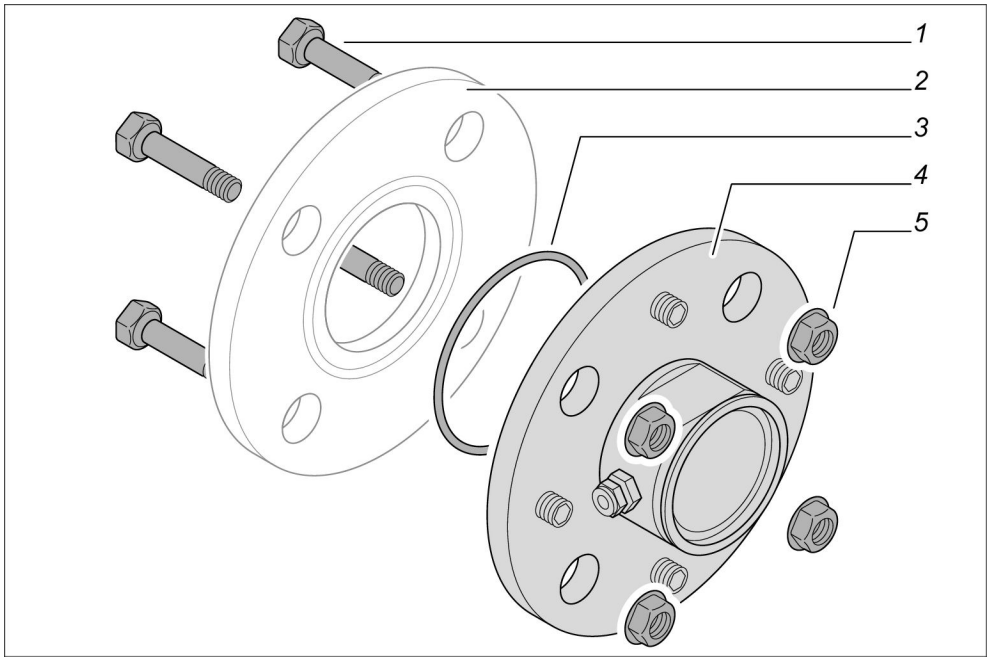
No.	Meaning
1	Receiver unit
2	Clamp
3	Purging flange
4	Installation flange
5	Transmitter unit

The purging flanges have a 1/4 inch Swagelok® connection for pipes with an 8 mm outside diameter.

Installing the purging flanges

Fitting the purging flanges to the installation flanges

The installation steps for the purging flanges are identical for the transmitter unit and the receiver unit.



No.	Meaning
1	4x M 16 bolts
2	Installation flange
3	Purging flange O-ring
4	Purging flange
5	4x M 16 nuts

Install the purging flanges as follows:

Step	Procedure
1	Insert the purging flange O-ring ***3*** into the groove of the installation flange ***2***.
2	Place the purging flange ***4*** on the installation flange ***2***.
3	Screw in the flange loosely.

Roughly pre-aligning the purging flanges

Using the alignment tool

We recommend using the laser alignment tool (available as an accessory) for rough coaxial alignment of the opposite purging flanges. The laser alignment tool consists of a laser pointer and a focusing screen.

Fine alignment of the purging flange takes place once all the devices have been electrically connected using the instrument software.

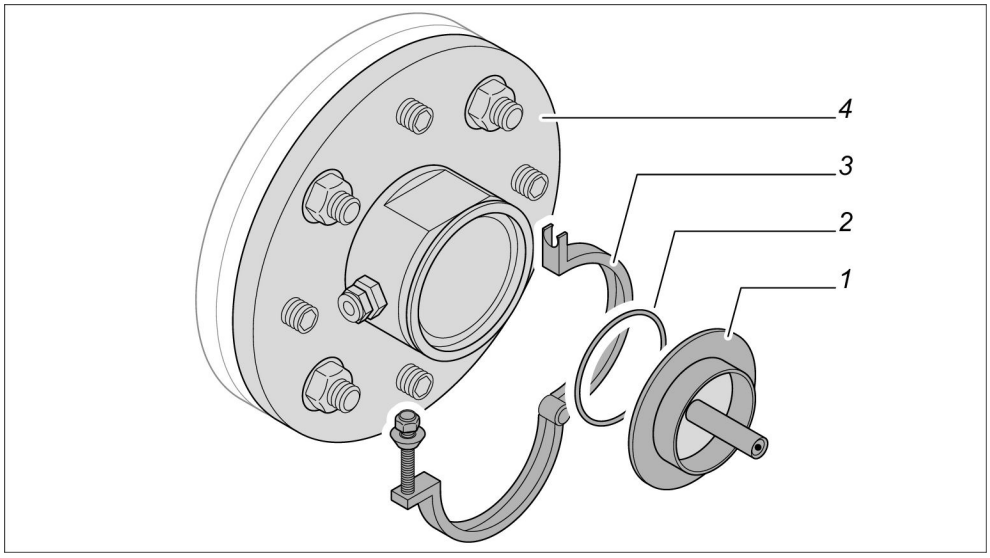
The clamps for fastening the laser alignment tool must only be used to fasten the laser pointer and the focusing screen. It is prohibited to use these clamps for mounting the transmitter unit and the receiver unit. The clamps are labeled with a corresponding note.

The laser alignment tool falls into laser protection class 3A.

Rough alignment: Three-step procedure

Step	Procedure
1	Install the laser pointer on the purging flange to which the transmitter unit should be mounted, and the focusing screen on the purging flange to which the receiver unit should be mounted. Perform the rough alignment.
2	Install the laser pointer on the purging flange to which the receiver unit should be mounted, and the focusing screen on the purging flange to which the transmitter unit should be mounted. Perform the rough alignment.
3	Install the laser pointer on the purging flange to which the transmitter unit should be mounted, and the focusing screen on the purging flange to which the receiver unit should be mounted. Perform the rough alignment.

Installing the laser pointer

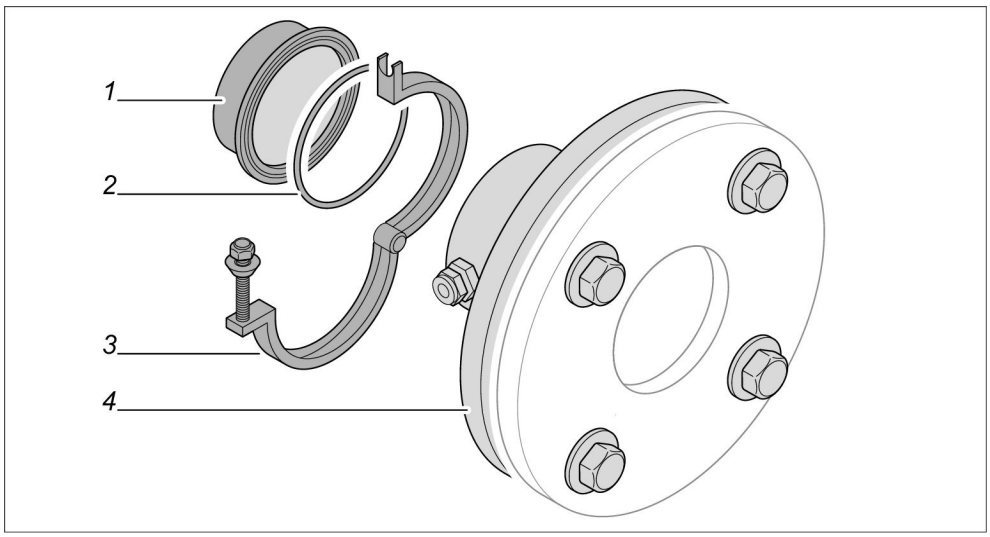


No.	Meaning
1	Laser pointer
2	Purging flange flat gasket
3	Clamp
4	Purging flange

Install the laser pointer as follows:

Step	Procedure
1	Place the purging flange flat gasket ***2*** into the groove of the purging flange ***4***.
2	Place the laser pointer ***1*** on the purging flange ***4***.
3	Fasten the laser pointer ***1*** using the clamp ***3***.

Installing the focusing screen



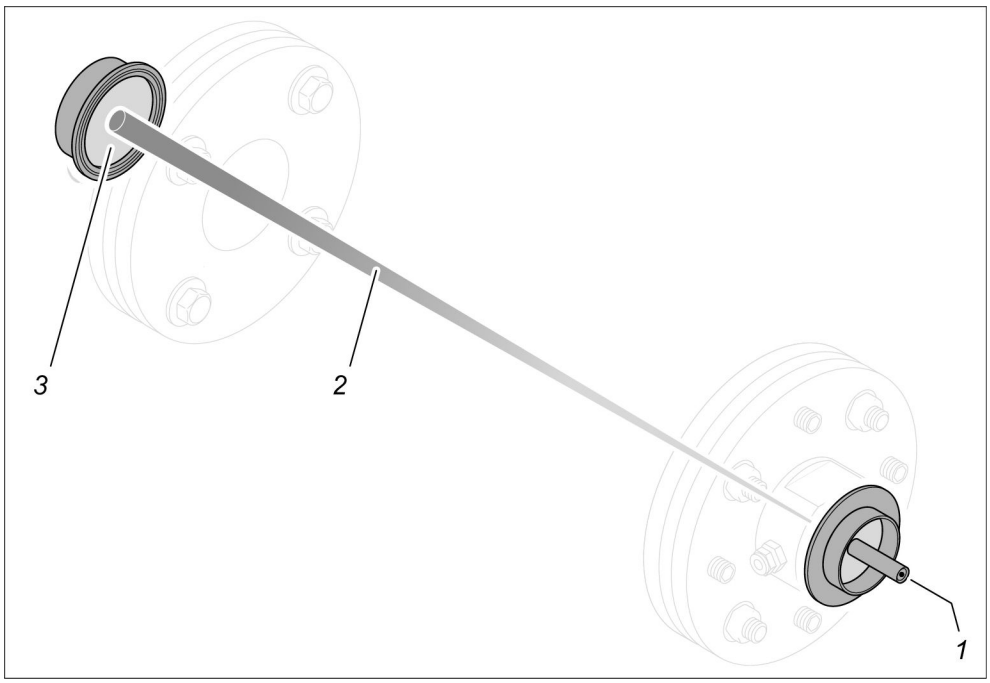
No.	Meaning
1	Focusing screen
2	Purging flange flat gasket
3	Clamp
4	Purging flange

Install the focusing screen as follows:

Step	Procedure
1	Place the purging flange flat gasket ***2*** into the groove of the purging flange ***4***.
2	Place the focusing screen ***1*** onto the purging flange ***4***.
3	Fasten the focusing screen ***1*** using the clamp ***3***.

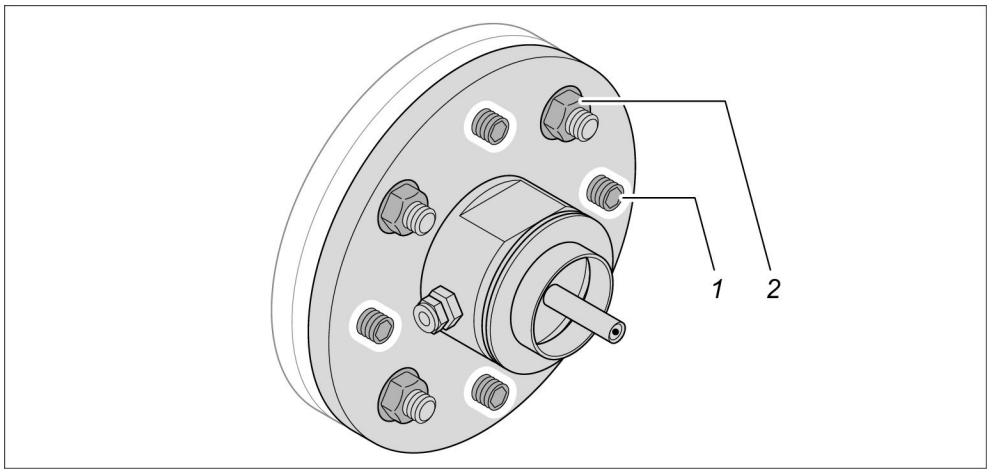
Principle of rough pre-alignment

During pre-alignment, the purging flanges installed opposite to one another are aligned coaxially to one another using the laser alignment aid.



No.	Meaning
1	Laser pointer on/off switch
2	Laser beam
3	Focusing screen

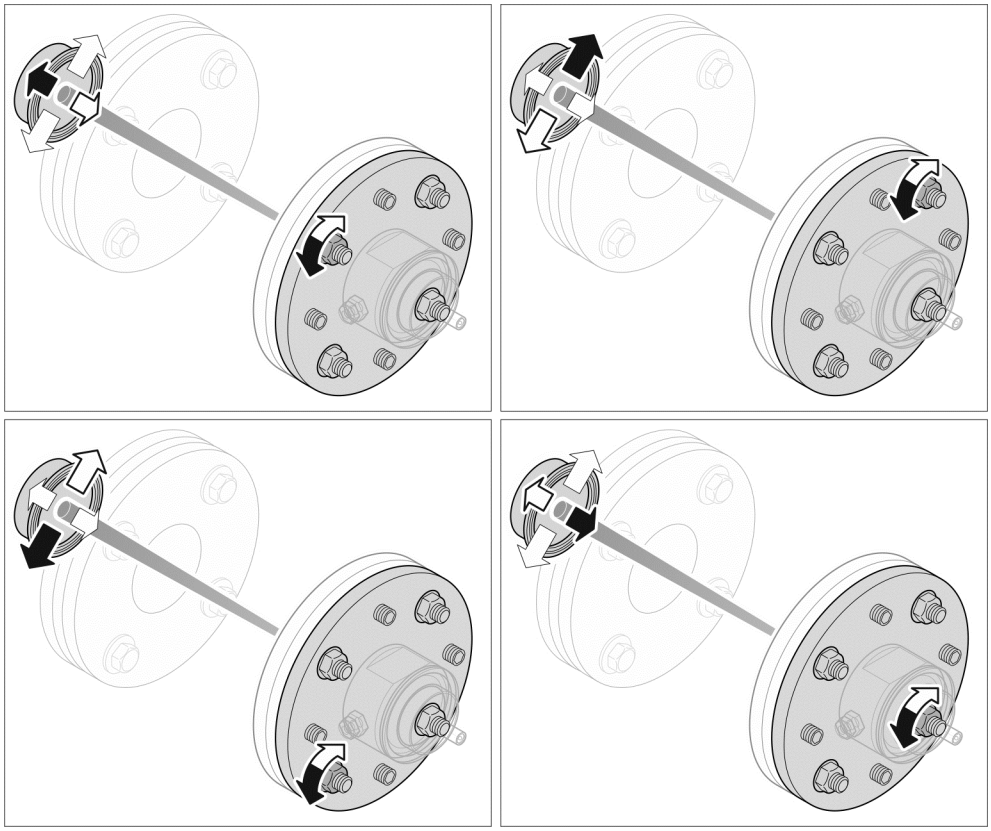
Roughly pre-aligning the purging flanges



No.	Meaning
1	4 stud screws
2	4 fastening nuts

Align the purging flanges as follows:

Step	Procedure
1	Unscrew the 4 stud screws ***1*** until the ends of the screws no longer protrude from the holes.
2	Switch on the laser pointer.
3	Align the purging flanges by adjusting the 4 fastening nuts ***2***, until the laser beam hits the center of the focusing screen.



4	Turn the 4 stud screws ***1*** until they reach a stop, so that they fix the setting.
5	Switch off the laser pointer.
6	Disassemble the laser pointer and the focusing screen.

The clamps for fastening the laser alignment tool must not be used for mounting the transmitter unit or receiver unit.

Connecting the purging lines

Connect the purging lines as follows:

Step	Procedure
1	For the purge gas supply to both purging flanges, connect a pipe with an 8 mm outside diameter to each purge gas connection (1/4 inch Swagelok® connection).

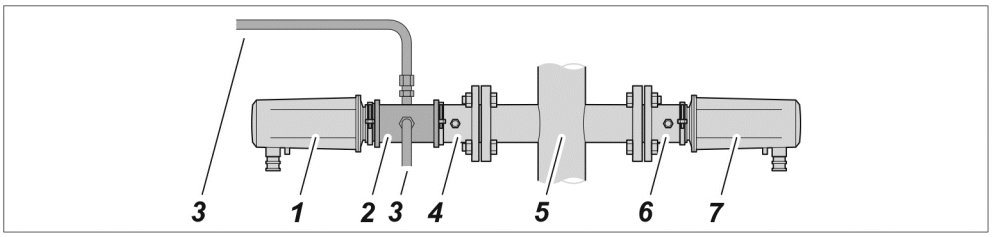
Option: Installing the validation cell

Providing an overview

Under what circumstances is a validation cell required?

If...	then...
validations must be performed on the process due to the application	a validation cell must be installed. This is included in the scope of delivery, depending on the application.
no validation cell is installed	validations can only be performed independently of the process on the separate calibration set.

Providing an overview



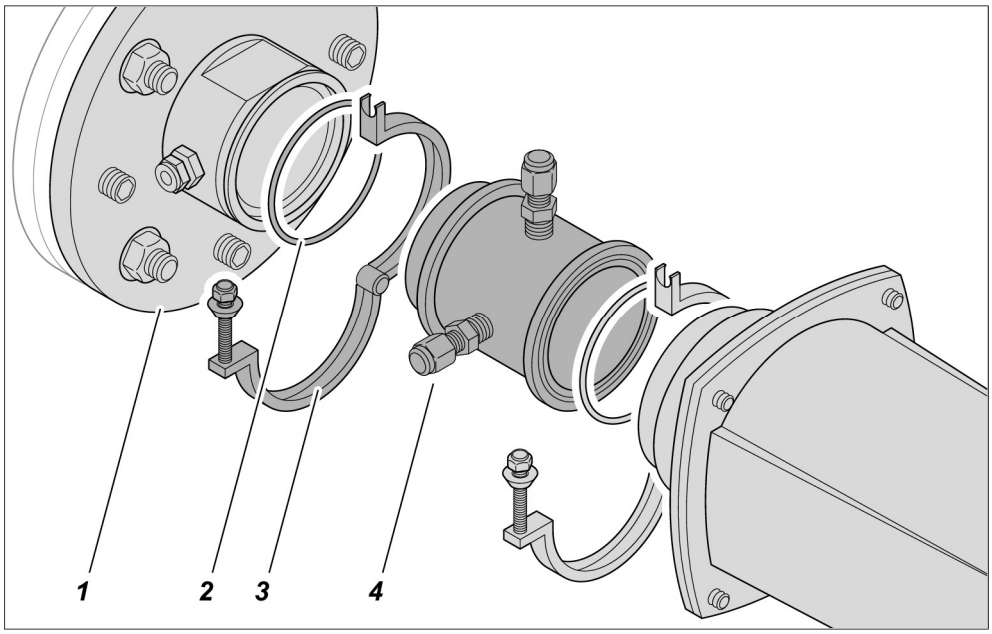
No.	Meaning
1	Transmitter unit
2	Validation cell
3	Test gas supply and discharge
4	Purging flange
5	Process
6	Purging flange
7	Receiver unit

The validation cell has two 1/4 inch Swagelok® connection for pipes with an 8 mm outside diameter.

The validation cell is to be installed on the side of the transmitter unit.

Installing the validation cell

Installing the validation cell



No.	Meaning
1	Purging flange
2	Purging flange flat gasket
3	Clamp
4	Validation cell

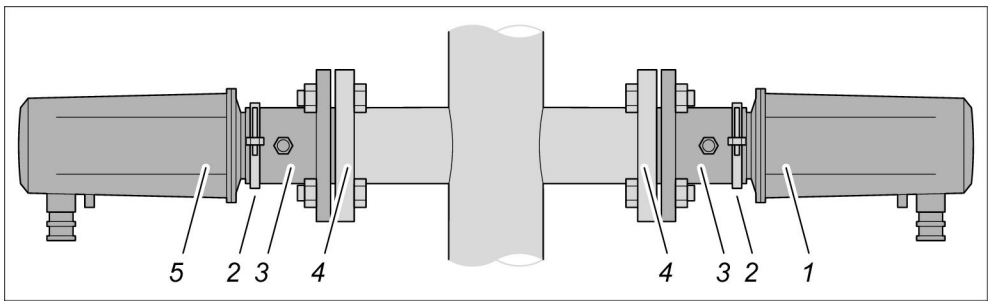
Install the validation cell as follows:

Step	Procedure
1	Place the purging flange flat gasket ***2*** into the groove of the purging flange ***1***.
2	Set the validation cell ***4*** on the purging flange ***1*** on the side of the transmitter unit.
3	Fasten the validation cell ***4*** using the clamp ***3***.
4	For the test gas supply and discharge, connect a pipe with an 8 mm outside diameter to each 1/4 inch Swagelok® connection.
5	Install the transmitter unit.

Installing the transmitter unit and receiver unit

Providing an overview

Providing an overview



No.	Meaning
1	Receiver unit
2	Clamp
3	Purging flange
4	Installation flange
5	Transmitter unit

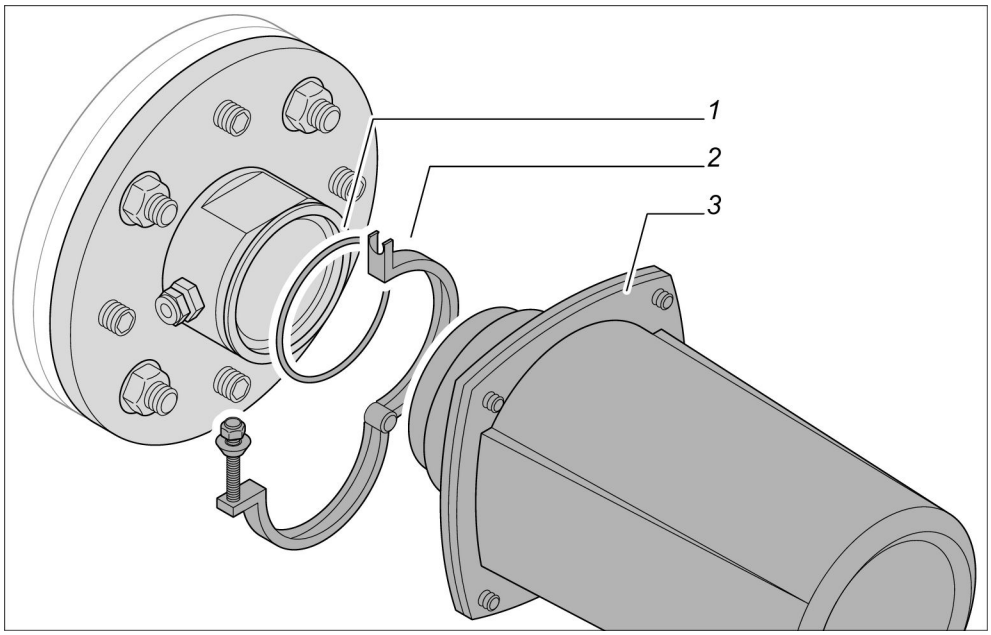
Installing the transmitter unit and receiver unit

Installing the transmitter unit and receiver unit

⚠ **The self-locking nuts of the clamps for mounting the transmitter unit and the receiver unit may only be used once.**

The clamps intended for fastening the laser alignment tool must not be used to install the transmitter unit or the receiver unit.

The transmitter unit and receiver unit are installed using exactly the same steps.



No.	Meaning
1	Purging flange flat gasket
2	Clamp
3	Transmitter unit or receiver unit

Install the transmitter unit and receiver unit as follows:

Step	Procedure
1	If necessary, replace the self-locking nuts for the clamps with new self-locking nuts.
2	Insert the purging flange flat gasket ***1*** into the groove of the purging flange.
3	Place the transmitter unit or the receiver unit onto the purging flange.
4	Attach the transmitter unit or the receiver unit using the clamp ***2***.

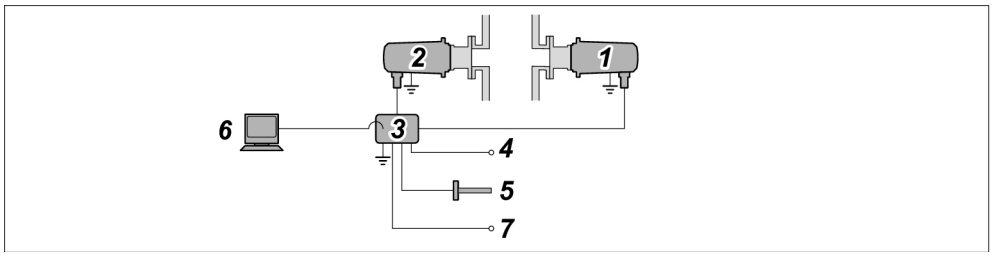
Purging after installation

To avoid damage to the parts of the gas analyzer affected by the process gas, process purging should be commissioned right after the gas analyzer is installed.

Connecting the electrical leads

Providing an overview

Providing an overview



No.	Meaning
1	Receiver unit
2	Transmitter unit
3	Junction box
4	Power supply
5	T/P probes
6	PC (can be connected temporarily)
7	Analog and digital outputs

Observing cable specifications

Connection cables for the transmitter unit and receiver unit

The connection cables are components of the transmitter unit and receiver unit. They are preinstalled at the factory.

Note: the connection cables must only be replaced with genuine replacement cables.

Cable type	8 x 2 x 0.5 mm^2; weather-resistant
Outer diameter	6.5...14 mm

Connection cables for P/T probes

Outer diameter	Min. 7 mm to max. 12 mm
Wire cross-section	Min. 0.5 mm^2 to max. 2.5 mm^2 (AWG 20-14)
Design	With shield

Connection cables for the power supply

Outer diameter	Min. 7 mm to max.12 mm to fit M20 cable gland
Wire cross-section	3 x min. 1.5 mm^2 to max. 2.5 mm^2 (AWG 16-14) Laying of single wires permitted only in the conduit
Flammability class	VW-1 and FT-1
Temperature resistance	Ambient temperature > 60 °C

Cable gland for the power supply

Cable gland	M20
Design	Fitting with integrated cable seal and option to connect a conduit
Conduitoutside diameter	19 mm

Potential equalization cables for transmitter unit, receiver unit and junction box

Cable cross-section	Max. 4 mm^2; typically 2.5 mm^2 (AWG 8 in accordance with CSA regulations)
Cable length	As short as possible (minimum length 1 m)

Protecting the line voltage supply

Requirements for protecting the line voltage supply

To protect the line voltage supply, proceed as follows:

- The feeder must be protected using an external overcurrent protection device.
- It must be possible to switch off the feeder using a separator (external switch).
- The separator must be located near the supplied device.
- The way in which the supplied device is arranged must not compromise the operation of the separator.
- The separator must be identified so that the assignment to the supplied device is clearly visible.

Installing the junction box

Installing the junction box

The junction box must be installed with the cable glands facing downward.

Install the wall bracket on the junction box according to the manufacturer's instructions (included in the delivery scope of the gas analyzer).

When mounting the junction box to a wall, use screws and wall plugs that can safely bear four times the weight of the junction box (4 x approx. 4.7 kg = approx. 19 kg).

Fitting the cable clips and line brackets

Requirements for cable clips and line brackets

The cable clips and line brackets must meet the following conditions:

- They must allow the cables and lines to be laid securely.
- It must be possible to open the cable clips and line brackets to allow the cables and lines to be removed temporarily for calibration of a separate calibration set or for servicing.

Fitting the cable clips and line brackets

Fit the cable clips and line brackets along the defined cable and line runs.

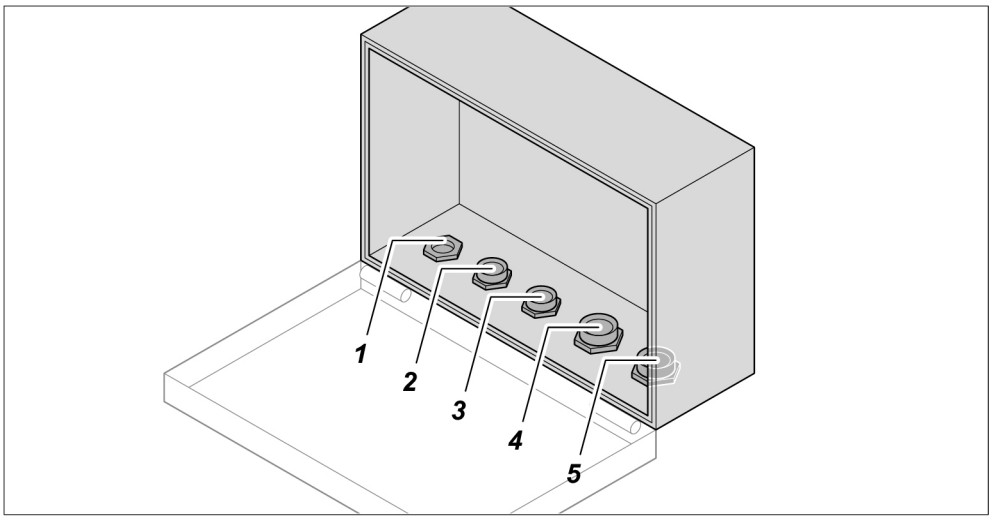
Selecting a suitable cable gland

Selecting a suitable cable gland

Select a suitable cable gland for each cable.

The following always applies:

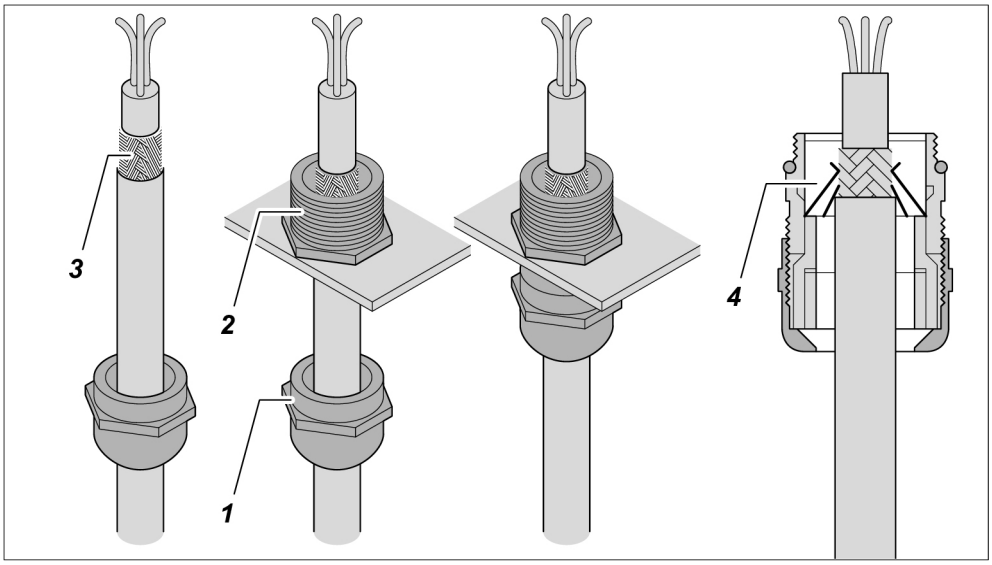
- Shielded cables must only be routed through metal cable glands.
- The cable diameter must fit the diameter of the cable gland.



No.	Cable	Cable gland	Cable diameter
1	Power supply	M20	8…15 mm
2	P/T probes	M20	7…13 mm
3	Analog and digital outputs	M20	7…13 mm
4	Receiver unit	M25	9…17 mm
5	Transmitter unit	M25	9…17 mm

Leading cables through cable glands

Metal cable glands



No.	Meaning
1	Union nut
2	Connection socket
3	Braided shield
4	Springs

Proceed as follows:

Step	Procedure
1	Feed the cable through the union nut and through the connection socket into the junction box until the springs come into contact with the bare or exposed braided shield.
2	Screw the union nut onto the connection socket. Tightening torque: M20 power supply: 10 Nm M20 P/T probes and analog/digital outputs: 12 Nm M25 Transmitter/receiver unit connection cable: 12 Nm
3	Close the junction box.

Establishing a protective grounding

Establishing a protective grounding

The protective grounding is established via the PE conductor of the power cable.

Proceed as follows:

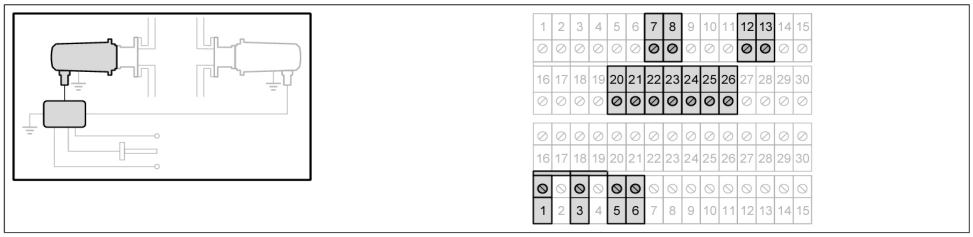
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

Connecting the transmitter unit to the junction box

Connecting the transmitter unit

Connect the transmitter unit to the junction box.

The wires in the connection cable are color coded to facilitate the assignment to the terminals.



Connections to the terminal strip are made as follows:

Terminal	Cable wire color	Function
1	White	+24 V
3	Brown	GND
5	Green	TURU_A
6	Yellow	TURU_B
7	Gray	AUX_A
8	Pink	AUX_B
12	Blue	AO1 (4...20 mA)
13	Red	AO2 (4...20 mA)
20	Black	INTERNAL
21	Violet	INTERNAL
22	Gray/pink	INTERNAL
-	Blue/red [1)]	(not assigned)
23	White/green	ETH_TX+
24	Brown/green	ETH_TX-
25	White/yellow	ETH_RX+
26	Brown/yellow	ETH_RX-

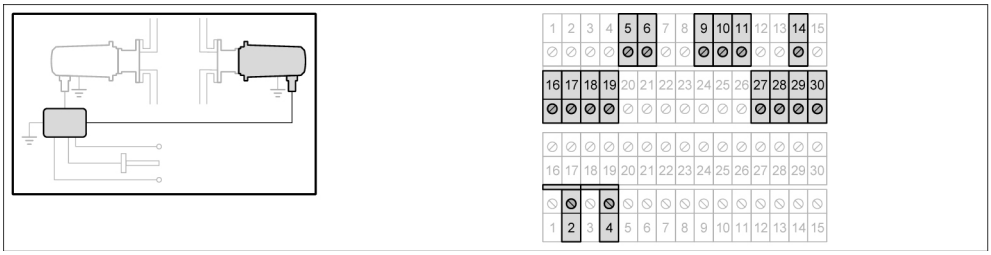
1) This wire is not used and must be secured in the junction box. If a power supply is installed in the junction box, the wire that is not used can be connected to a free PE terminal. Otherwise, the wire must be insulated with shrinkdown plastic tubing and fixed to the cable harness with cable ties.

Connecting the receiver unit to the junction box

Connecting the receiver unit

Connect the receiver unit to the junction box.

The wires in the connection cable are color coded to facilitate the assignment to the terminals.



Connections to the terminal strip are made as follows:

Terminal	Cable wire color	Function
2	White	+24 V
4	Brown	GND
5	Green	TURU_A
6	Yellow	TURU_B
9	Gray	AUXIF_A
10	Pink	AUXIF_B
11	Red	AUX_IO
14	Blue	AO3 (4...20 mA)
16	Black	DO1_A
17	Violet	DO1_B
18	Gray/pink	DO2_A
19	Blue/red	DO2_B
27	White/green	T-Probe_in
28	Brown/green	T-Probe_out
29	White/yellow	P-Probe_in
30	Brown/yellow	P-Probe_out

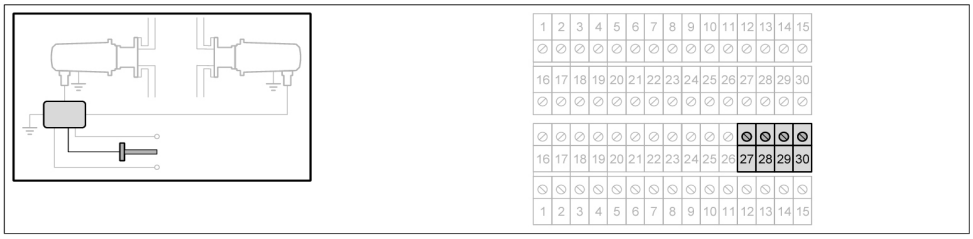
Option: connecting the T/P probes to the junction box

Connecting T/P probes

The T/P probes for dynamic temperature and pressure correction are not included in the delivery scope.

The T/P probes require a separate power supply and must provide a 4…20-mA output signal.

Connect the T/P probes to the junction box.



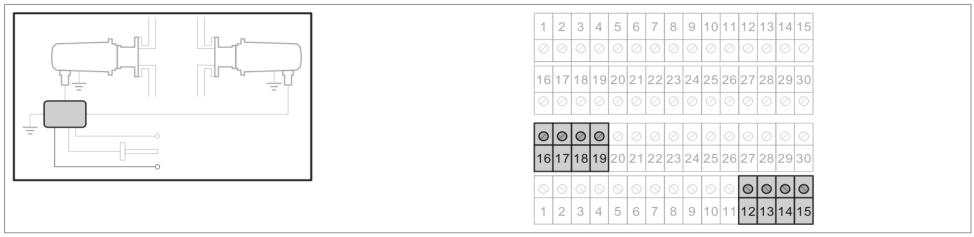
Connections to the terminal strip are made as follows:

Terminal	Signal	Function
27	T probe in (+)	4…20-mA input
28	T probe out (-)	Analog input for dynamic temperature correction
29	P probe in (+)	4…20-mA input
30	P probe out (-)	Analog input for dynamic pressure correction

Connecting the analog and digital outputs to the junction box

Connecting analog and digital outputs

Connect the analog and digital outputs to the junction box.



Connections to the terminal strip are made as follows:

Terminal	Signal	Function
12	AO1 (4...20mA)	Analog output 1
13	AO2 (4...20mA)	Analog output 2
14	AO3 (4...20mA)	Analog output 3
15	GND	Analog outputs GND
16	DO1_A	Digital output 1
17	DO1_B	
18	DO2_A	Digital output 2
19	DO2_B	

Layout of the analog and digital outputs

The assignment of the analog and digital outputs is determined during the installation and configuration of the gas analyzer.

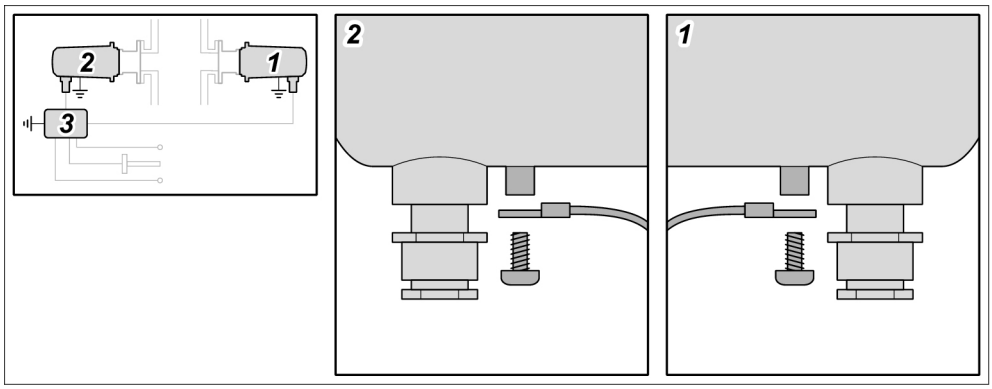
Connecting equipotential bonding

Connecting equipotential bonding

In order to select the correct cable, please note the cable specifications

Connect the following devices via a ground cable to the local potential equalization terminal:

- Transmitter unit
- Receiver unit
- Junction box



No.	Meaning
1	Receiver unit
2	Transmitter unit
3	Junction box

The potential equalization terminal prevents the cable from twisting during installation and prevents it from coming loose during operation.

Connecting the power supply

This section only describes how to wire the power supply.

The device immediately starts up when the supply voltage is applied, but it is not possible to recognize when this has happened. For this reason, the supply voltage must not yet be applied!

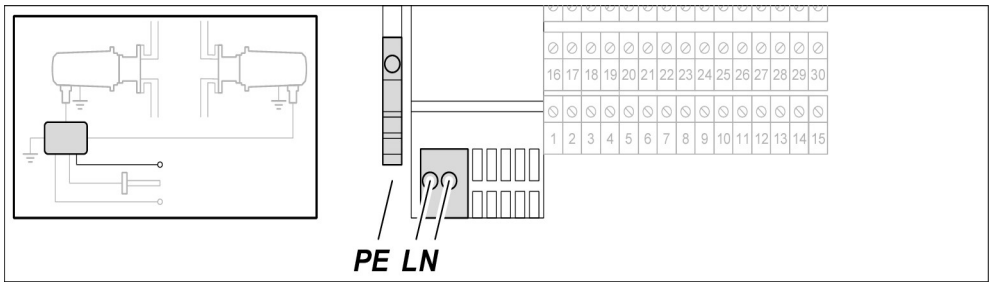
Note the cable specification!

Infrared laser beam invisible to the human eye.

Risk of eye injury in the event of accidental startup.

Keep device disconnected until final inspection.

Connecting the 100-240 V AC power supply



Connections to the power supply unit are made as follows:

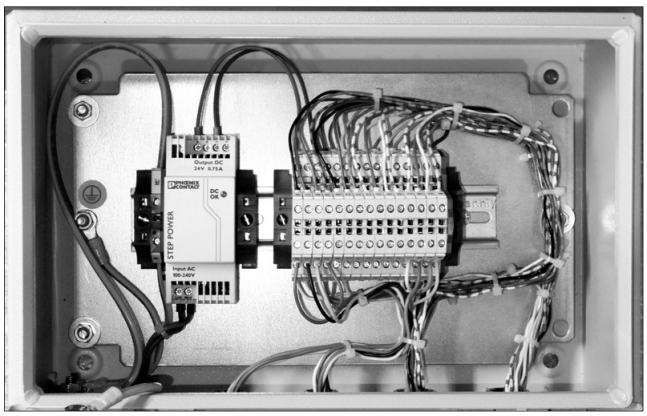
Terminal	Cable wire color	Position	Function
PE	Green/yellow	PE terminal strip	Protective earth
L	Brown	Power supply	100...240 V AC (phase)
N	Blue	Power supply	100...240 V AC (neutral)

Tightening torque of the screw terminals: 0.5 to 0.6 Nm

On the secondary side, the connection between the power supply unit and the terminal strip is already wired at the factory.

Laying lines safely

As shown in the figure, within the junction box, the primary lines and the secondary lines must be laid at a distance and secured in such a way that contact between them is excluded.



Gas analyzer start-up

Testing and approving gas analyzer

Performing a final check of the gas analyzer

Ensure that all pre-startup conditions are met.

Proceed in accordance with the following checklists:

Checking ambient conditions

Test object	Requirement
Transmitter unit, receiver unit, junction box	The ambient temperature is consistent with the information on the name plate.

Checking the mechanical system

Test object	Requirement
Junction box	The junction box meets the following requirements: ▪ The junction box is not damaged ▪ The junction box has been installed in a stable manner ▪ The junction box is closed so that no dust can penetrate
Transmitter unit, receiver unit	The transmitter unit and receiver unit are in the following condition: ▪ The housings are not damaged ▪ The housing covers are closed and bolted ▪ All of the fixing screws are present.

Test object	Requirement
	The transmitter unit and receiver unit are installed so that the following requirements are met: ▪ The housings do not come into contact with any overpressure in the process gas path ▪ The housings are not improperly heated by the heat generated at the contact point of the process gas path (purging flange).

Checking the electrical system

Test object	Requirement
Cable condition	All cables are undamaged.
Cable types	All connections are made using the specified cable type.
Shielded cables	The shielded cables meet the following requirements: ▪ The cables are fed through metal cable glands ▪ The braided shield is properly connected to the cable gland
Supply voltage	The supply voltage is consistent with the information on the name plate of the junction box.
Connecting cables	All connecting cables meet the following requirements: ▪ The cables are properly installed and secured ▪ The cables in the junction box are connected using the correct pin assignment ▪ The cables in the cable glands are sealed so that no dust can penetrate ▪ All of the unused cable wire ends are insulated or grounded
Cable glands	▪ The cables in the cable glands on the transmitter unit and receiver unit are fitted in a fixed position and cannot move.
Potential equalization terminal	The following devices are connected via a ground cable to the local potential equalization terminal: ▪ Transmitter unit ▪ Receiver unit ▪ Junction Box

Approving the analyzer for startup

If...	then...
all the checks have been completed with positive results	the analyzer may be put into use.
at least one check gave a negative result	the analyzer may not be put into use.
	the fault must be rectified.
	the check must be repeated.

Connecting the supply voltage

Connecting the supply voltage

Connect the supply voltage.

Recognizing the operating status

Operating condition: "Starting-up"

The Starting-up operating condition applies as soon as the analyzer is switched on.

Phase	Action
1	The analyzer is switched on.
2	The analyzer loads the basic configuration.
3	The analyzer performs a self-test.
4	The analyzer is ready for initialization.

Operating condition: "Initializing"

The Initializing operating condition applies as soon as starting-up is complete.

Phase	Action
1	The analyzer checks the settings.
2	The analyzer checks that it is ready for operation.

If...	then...
the settings are correct and the analyzer is ready for use	the analyzer switches to "Measuring" status.
at least one of the settings is not correct or the analyzer is not ready for use	the analyzer issues an error message.
	the analyzer switches to the "Malfunction" operating status.

Operating condition: "Measuring"

The Measuring operating condition applies as soon as initialization is completed successfully. The "Measuring" operating status is the regular operating status during continuous operation.

Operating condition: "Malfunction"

The Malfunction operating condition applies when an error has occurred (also see Error messages in the Malfunction operating condition, see page 110).

Phase	Action
1	An error occurs.
2	The digital output 1 sends an error signal to the system.
3	The analyzer ends the measuring process.

Operating condition: "Service"

The Service operating condition can be started manually by the operator.

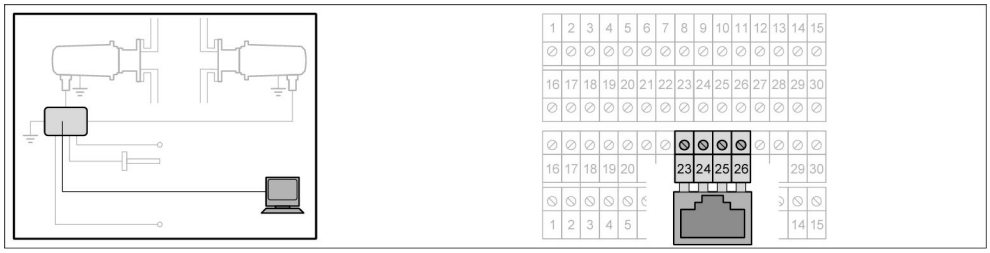
In the "Service" operating status, you can perform actions such as the following:

- View the spectrum
- Performing calibration
- Enable the measurements log

Connecting the PC to the junction box

Connecting the PC

An RJ45 adapter board is provided for connecting the analyzer to a PC.



Proceed as follows:

Step	Procedure
1	Open the junction box.
2	Connect the RJ45 adapter board to terminals 23–26 in the junction box.
3	Connect the PC to the RJ45 adapter board using a patch cable.

Connections to the terminal strip are made as follows:

Terminal	Signal	Function
23	ETH TX+	Ethernet TX+
24	ETH TX-	Ethernet TX-
25	ETH RX+	Ethernet RX+
26	ETH RX-	Ethernet RX-

Connecting to the instrument software

Instrument software in the web browser

The instrument software is an integral component of the transmitter unit and the receiver unit. It is accessed via a web browser.

The Web browsers Mozilla® Firefox® and Google Chrome™ are approved for use with the device software.

Note: Mozilla and Firefox are registered trademarks of the Mozilla Foundation. Chrome is a trademark of Google Inc.

Connecting the devices

Proceed as follows:

Step	Procedure
1	Ensure that transmitter unit and receiver unit are connected to the junction box and ready for operation.
2	Ensure that a PC is connected to the junction box.

Starting the instrument software

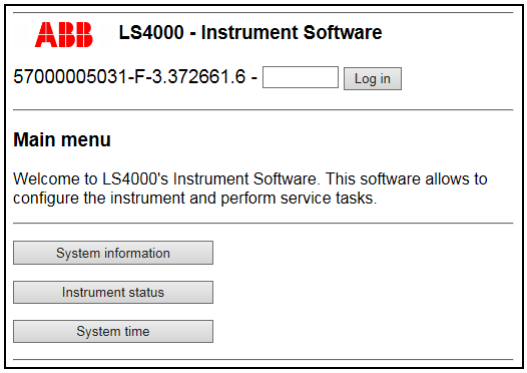
To start the instrument software, you need the IP address of the analyzer.

The factory-set IP address is provided in the analyzer data sheet.

Proceed as follows:

Step	Procedure
1	Start up the PC.
2	Start up the web browser on your computer.
3	In your web browser, type the IP address of the analyzer.

The user interface of the instrument software is displayed:



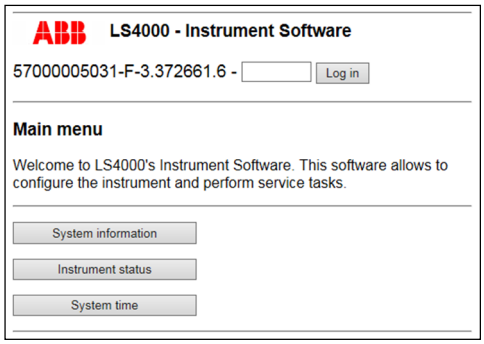
Menu structure of the instrument software

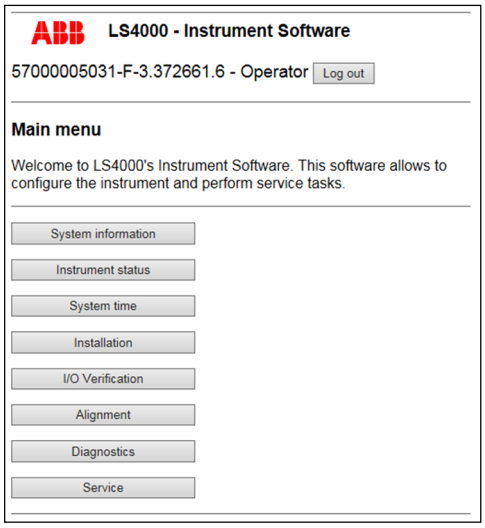
Main menu

- System information
- Instrument status
- System time
- Installation
  - Cable length
  - Process parameters
  - Installation flanges
  - Ambient conditions
  - Channels
  - Analog and digital outputs
  - Save settings
- I/O verification
- Alignment
- Diagnostics
- Service
  - Network settings
  - Spectrum
  - Calibration
  - Instrument logging

All menu illustrations in these operating instructions are examples.
The actual menu display in the web browser may vary.

Main menu





Intended use

Enter password and log in as an operator.

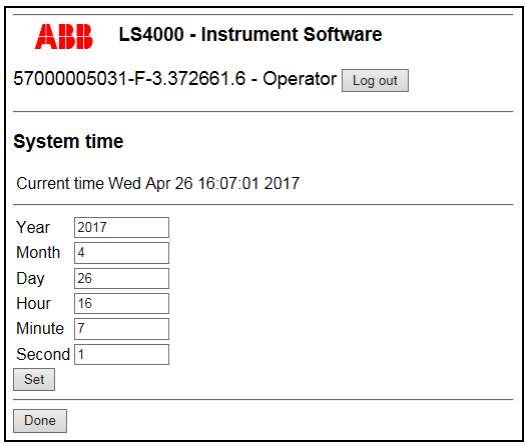
Open menus

Description

Name	Meaning/function	Password entry
Log in	Enter the password and login The operator password is "xs2ls".	
Log out	Log out and return to the main menu without password entry	
System information	Call up the System information menu (see page 82)	without / after
Instrument status	Call up the Instrument status menu (see page 83)	without / after
System time	Call up the System time menu (see page 59)	without / after
Installation	Call up the Installation menu (see page 63)	after
I/O Verification	Call up the I/O verification menu (see page 84)	after
Alignment	Call up the Alignment menu (see page 62)	after
Diagnostics	Call up the Diagnostics menu (see page 85)	after
Service	Call up the Service menu (see page 86)	after

The numbers which are displayed on the left next to the log in entry field are the serial number of the transmitter unit and the manufacturing no. (F-no) of the gas analyzer.

System time menu



Intended use

Set system time

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Current time	View the current system time
Year	Enter the year of the current date
Month	Enter the month of the current date
Day	Enter the day of the current date
Hour	Enter the hour of the current time
Minute	Enter the minutes of the current time
Second	Enter the seconds of the current time
Set	Activate your entries
Done	Exit menu

Restart the gas analyzer

We recommend that you perform a restart of the gas analyzer after changing system time settings. To do so, switch off the gas analyzer and power it back up again. Afterwards, check in the System time menu that the changed system time settings have been accepted.

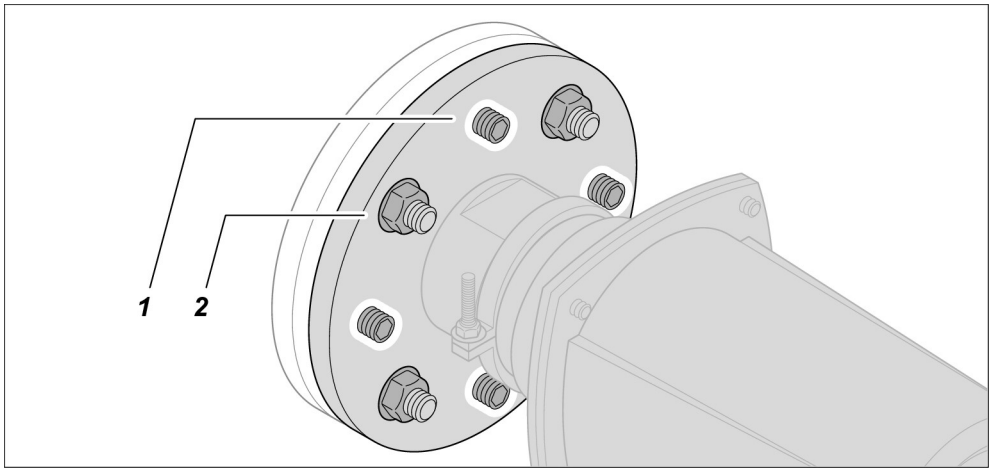
Fine alignment of the purging flanges

Call up the Alignment menu

Proceed as follows:

Step	Procedure
1	Log on as an operator. The operator password is "xs2ls". The Main menu is displayed.
2	Call up the Alignment menu (see page 62). The "Alignment" menu appears. The current values "Relative transmission" and "Absolute transmission" appear.
3	Click on "Align". The analyzer is now ready for fine alignment.

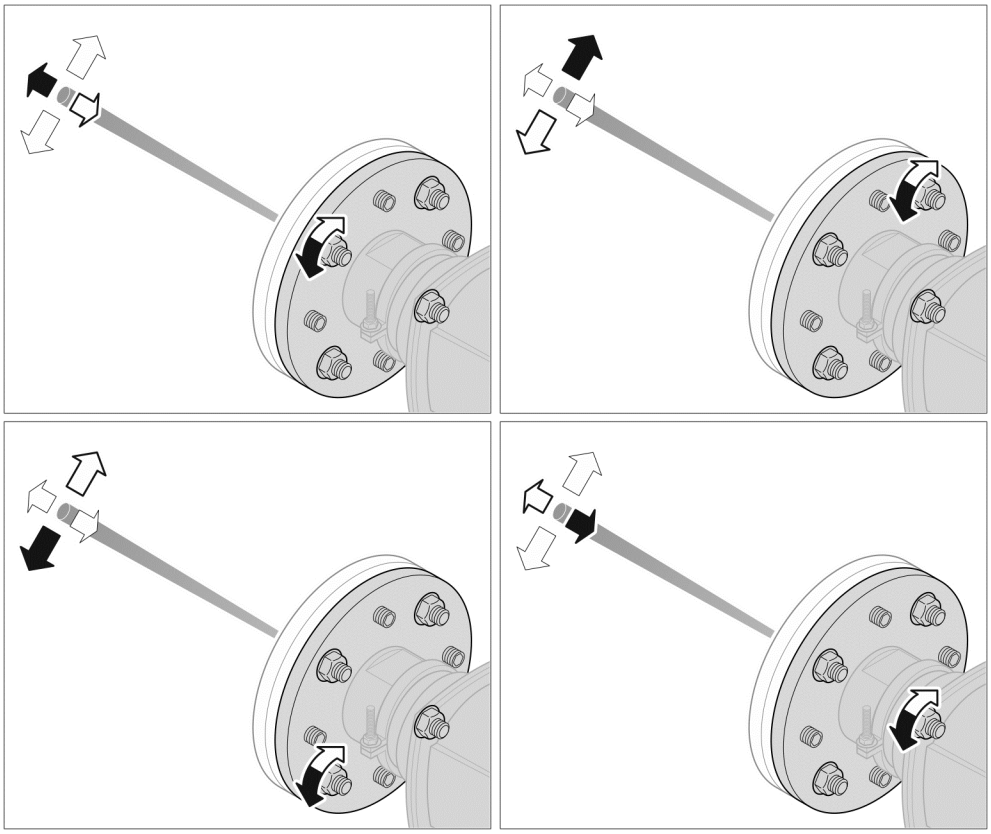
Fine alignment of the purging flanges



No.	Meaning
1	4 stud screws
2	4 fastening nuts

Proceed as follows:

Step	Procedure
1	Unscrew the 4 stud screws until the ends of the screws no longer stick out of the holes.
2	While observing the value "Absolute transmission" in the Alignment menu, align the purging flanges by adjusting the 4 fastening nuts. Adjust the purging flange so that the highest possible value is displayed for "Absolute transmission".



Completing the fine alignment

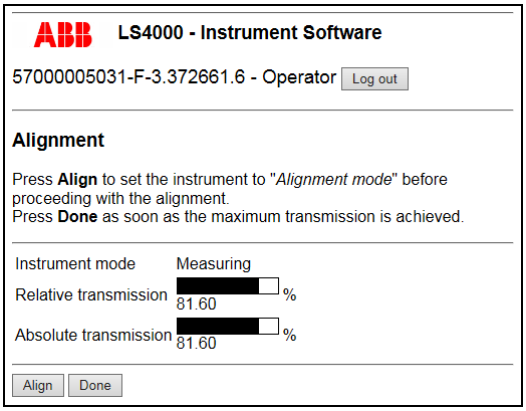
Proceed as follows:

Step	Procedure
1	Screw in the 4 stud screws as far as they will go so that they secure the setting.
2	Click on "Done".
3	If you do not want to perform any further tasks on the device software, disconnect the RJ45 adapter board from the junction box.
4	Seal the junction box

Readiness to measure

The analyzer is set to the process parameters specified by the user when delivered. If the specifications correspond to the conditions that actually apply to the process (temperature, pressure, optical path length, etc.), the analyzer can be put directly into operation after fine alignment.

Alignment menu



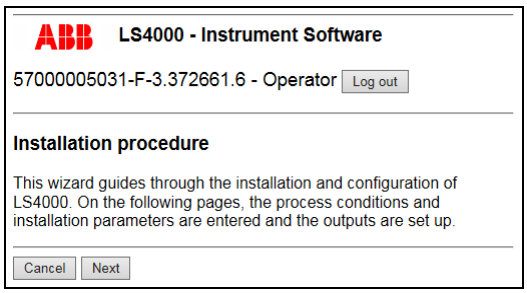
Intended use

Perform fine alignment of the transmitter and receiver unit purging flanges

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Instrument mode	Operating condition of the analyzer
Relative transmission	Measured relative transmission
Absolute transmission	Measured absolute transmission
Align	Start fine alignment of the purging flange (see page 60)
Done	Exit menu

Installation procedure menu



Intended use

Call up the configuration assistant

Start the 7-step configuration routine

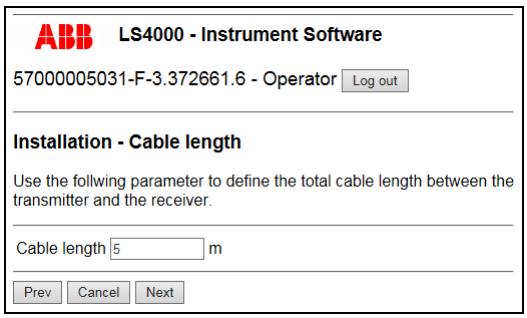
Description

Name	Meaning/function
Log out	Log out and return to the main menu
Cancel	Exit menu
Next	Start configuration routine

Configuration routine

Step	Procedure
1	Enter the length of the connection cable (see page 64).
2	Enter physical properties for the process (see page 65).
3	Enter physical properties for the flanges (see page 67).
4	Enter physical properties for the measuring environment (see page 69).
5	Configure measuring channels (see page 70).
6	Configure analog and digital outputs (see page 72).
7	Check settings and save or reject (see page 74). End configuration routine.

Installation - Cable length menu



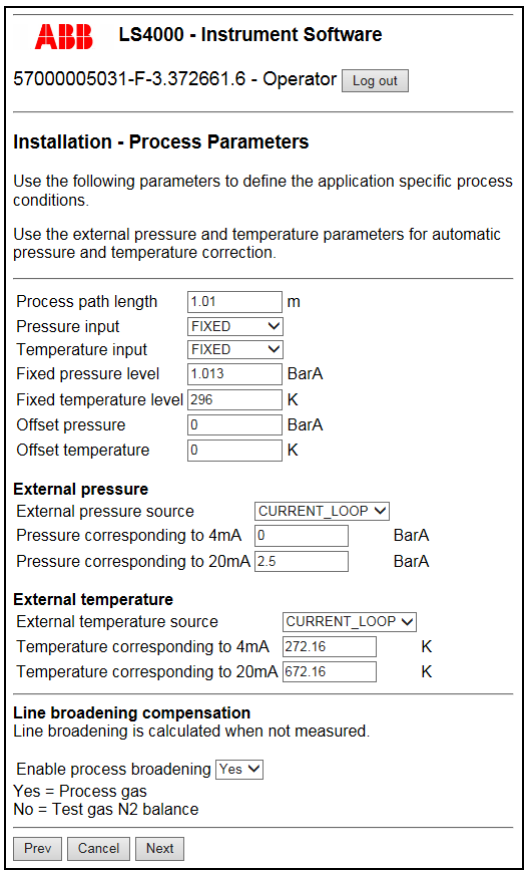
Intended use

Enter the length of the connection cables

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Cable length	Enter the total length of the connection cables of the transmitter and receiver unit The length of the connection cables is provided in the analyzer data sheet.
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

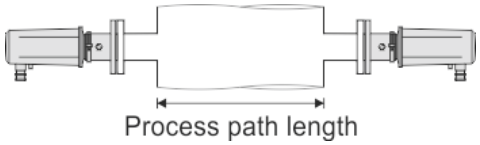
Installation - Process parameters menu



Intended use

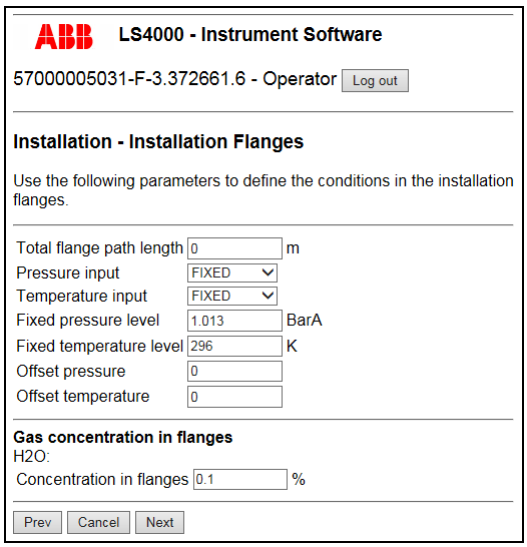
Enter physical properties for the process

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Process path length	Enter the length of the measuring section through the process between the flanges  When using insertion pipes: enter the free path length between the insertion pipes
Pressure input	Select the source of the value for the pressure FIXED: Use a manually entered process value EXTERNAL: Use the value measured using a connected P-probe AMBIENT: Use the ambient value measured by the analyzer

Name	Meaning/function
Temperature input	Select the source of the value for the temperature FIXED: Use a manually entered value EXTERNAL: Use the value measured using a connected T-probe AMBIENT: Use the ambient value measured by the analyzer
Fixed pressure level	Enter a fixed value for the pressure
Fixed temperature level	Enter a fixed value for the temperature
Offset pressure	Enter the difference between the measured and actual pressure in the process
Offset temperature	Enter the difference between the measured and actual temperature in the process
External pressure source	Select interface to connect the P-probe CURRENT LOOP: 4 - 20 mA input
Pressure corresponding to 4 mA	Enter the pressure value that corresponds to a current of 4 mA
Pressure corresponding to 20 mA	Enter the pressure value that corresponds to a current of 20 mA
External temperature source	Select interface to connect the T-probe CURRENT LOOP: 4 - 20 mA input
Temperature corresponding to 4 mA	Enter the temperature value that corresponds to a current of 4 mA
Temperature corresponding to 20 mA	Enter the temperature value that corresponds to a current of 20 mA
Enable process broadening	YES: Measurement with correction of the cross-sensitivity matrix (for in-process measurement) NO: NH_3measurement without cross-sensitivity correction (for calibration and validation)
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation - Installation flanges menu



Intended use

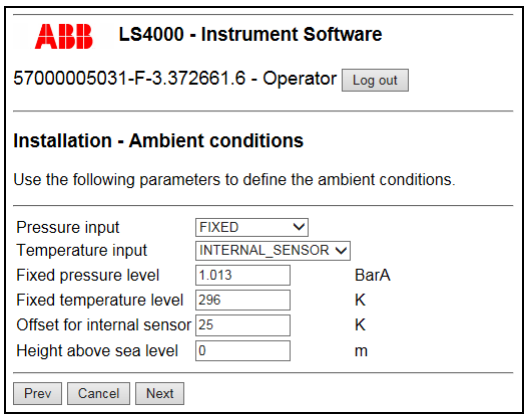
Enter physical properties of the flanges

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Total flange path length	Enter the length of the measuring section through the flanges and, if applicable, through the validation cells or insertion tubes 
Pressure input	Define the source of the value for the pressure FIXED: Use a manually entered value PROCESS: Use the process value AMBIENT: Use the ambient value measured by the analyzer
Temperature input	Define the source of the value for the temperature FIXED: Use a manually entered value PROCESS: Use the process value AMBIENT: Use the ambient value measured by the analyzer
Fixed pressure level	Enter a fixed value for the process gas pressure in the flanges
Fixed temperature level	Enter a fixed value for the purging gas temperature in the flanges
Offset pressure	Enter an offset value for the process gas pressure in the flanges
Offset temperature	Enter an offset value for the purging gas temperature in the flanges

Name	Meaning/function
Concentration in flanges	Enter H_2O concentration in the flanges 0 % with dry N_2 or 0.1 % with dry compressed air
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation - Ambient conditions menu



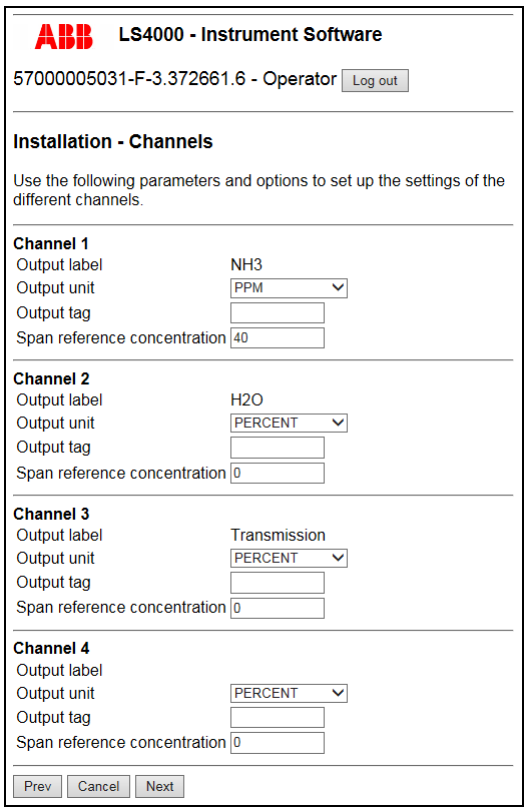
Intended use

Enter physical properties of the measuring environment

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Pressure input	CALCULATED: Use the value calculated from the entered height of the installation location FIXED: Enable entry of a fixed value
Temperature input	INTERNAL SENSOR: Use the measured value FIXED: Enable entry of a fixed value
Fixed pressure level	Enter a fixed value
Fixed temperature level	Enter a fixed value
Offset for internal sensor	Enter the difference between the measured and actual temperature
Height above sea level	Enter the height of the installation location above sea level
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation - Channels menu



Intended use

Configure the measuring channels

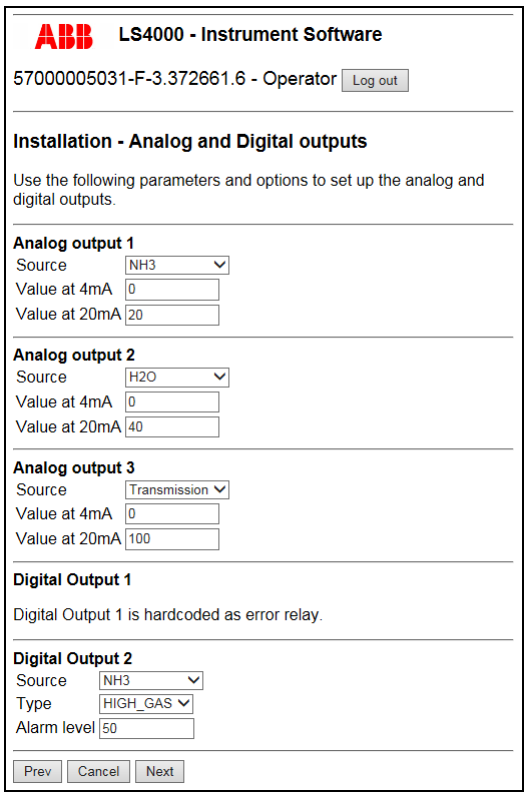
Description

Name	Meaning/function
Log out	Log out and return to the main menu
Channel 1	Measuring channel 1
Output label	NH_3 - description of measuring channel 1
Output unit	Unit for the value at output 1
Output tag	not used
Span reference concentration	Enter gas concentration in the internal validation cell Preset: 80% of the measuring range
Channel 2	Measuring channel 2
Output label	H_2O - description of measuring channel 2
Output unit	Unit for the value at output 2
Output tag	not used
Span reference concentration	Enter gas concentration in the internal validation cell Preset: 80% of the measuring range
Channel 3	Measuring channel 3
Output label	Transmission - description of measuring channel 3
Output unit	Unit for the value at output 3
Output tag	not used

Name	Meaning/function
Span reference concentration	Enter gas concentration in the internal validation cell Preset: 80% of the measuring range
Channel 4	Measuring channel 4
Output label	Description of measuring channel 4
Output unit	Unit for the value at output 4
Output tag	not used
Span reference concentration	Enter gas concentration in the internal validation cell Preset: 80% of the measuring range
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

The layout of the measuring channels presented in the figure and described in the table is an example. The actual layout is specific to each device and can differ from this.

Installation - Analog and digital outputs menu



Intended use

Configure analog and digital outputs

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Analog output 1	Analog output 1
Source	Assign the measuring channel to the analog output Factory setting: NH3
Value at 4 mA	Enter the measured value that corresponds to a current of 4 mA
Value at 20 mA	Enter the measured value that corresponds to a current of 20 mA
Analog output 2	Analog output 2
Source	Assign the measuring channel to the analog output Factory setting: H2O
Value at 4 mA	Enter the measured value that corresponds to a current of 4 mA
Value at 20 mA	Enter the measured value that corresponds to a current of 20 mA
Analog output 3	Analog output 3
Source	Assign the measuring channel to the analog output Factory setting: Transmission

Name	Meaning/function
Value at 4 mA	Enter the measured value that corresponds to a current of 4 mA
Value at 20 mA	Enter the measured value that corresponds to a current of 20 mA
Digital Output 1	Digital output 1 The digital output 1 is set as an error relay.
Digital Output 2	Digital output 2
Source	Assign the measuring channel to the digital output Factory setting: NH3
Type	Select the digital output operating mode (HIGH_GAS / Error) Factory setting: HIGH_GAS
Alarm level	Enter the measured value at which, if it is exceeded, the digital output must be switched (if HIGH_GAS operating mode is selected)
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

The layout of the outputs presented in the figure and described in the table is an example. The actual layout is specific to each device and can differ from this.

Installation - Save settings menu

Intended use

Check entries

Save or discard entries

End configuration routine

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Please review …	Display of the entries and settings made during the configuration routine
Save	Save entries and settings End configuration routine Return to main menu
Cancel	Discard entries and settings End configuration routine Return to main menu

Maintaining and servicing the gas analyzer

Schedule

Schedule for maintenance and service

Continuous	▪ Monitoring optical transmission (see page 76)
As required	▪ Checking optical components (see page 77)
	▪ Cleaning optical components (see page 77)
	▪ Cleaning housing (see page 77)
	▪ Validating analyzer (see page 91)
Annual	▪ Testing analyzer (see page 79)
	▪ Calibrating analyzer (see page 97)

Monitoring optical transmission

Monitoring optical transmission

The optical transmission is monitored by reading the values for the current output that is assigned to the "Transmission" measuring channel.

Proceed as follows:

Step	Procedure
1	Read the value at the current output that is assigned to the "Transmission" measuring channel.

If...	then...
the value is between 5 mA and 20 mA	this means that: ▪ the optical transmission is sufficient. ▪ the optical components do not require cleaning.

An optical transmission > 5 % is sufficient.

Checking and cleaning the components

Checking the optical components

Optical components are all the components through which the laser beam passes. Depending on the design of the analyzer, this may include:

- The transmission unit lens
- The receiver unit lens
- Isolation flanges (optional)
- Validation cell (optional)

Proceed as follows:

Step	Procedure
1	Check all optical components to ensure they are undamaged. It is advisable to perform this check when the transmission and receiver units have to be dismantled from the process for calibration.

If...	then...
an optical component is scratched or damaged	the optical component must be replaced.

Cleaning the optical components

⚠ **The optical components have a sensitive coating. There is a risk of them being scratched.**

Do not touch the optical components with your fingers! Wear gloves!

Only use approved and recommended cleaning agents and equipment when cleaning the optical components.

Approved and recommended equipment:

- Soft cotton gloves
- Soft microfiber cloths
- Soft brushes
- Cotton swabs
- Cotton buds
- Bellows
- Oil-free, soft compressed air

Approved and recommended cleaning agents:

- For normal soiling:
  Conventional washing-up liquid, diluted with distilled water.
- For heavy soiling:
  A 1:1 mixture of clean isopropyl alcohol and distilled water.

Proceed as follows:

Step	Procedure
1	Remove dust, sand and other loose dirt when dry.
2	Thoroughly spray the optical component with cleaning agent.
3	Wait until the dirt has dissolved and drips off with the cleaning agent.
4	Carefully wipe away any dissolved dirt that is still adhering to the surface.
5	Rinse with distilled water.
6	Wipe the optical component dry.

Clean the housing

Wipe the housing surfaces with a dry or damp cloth (dampened with water).

⚠ **Do not use cleaning agents to clean the housing, as these may damage the seals.**

Testing the analyzer

Testing the analyzer

Proceed in accordance with the following checklists:

Checking ambient conditions

Test object	Requirement
Transmitter unit, receiver unit, junction box	The ambient temperature is consistent with the information on the name plate.

Checking the mechanical system

Test object	Requirement
Junction box	The junction box meets the following requirements: ▪ The junction box is not damaged ▪ The junction box has been installed in a stable manner ▪ The junction box is closed so that no dust can penetrate
Transmitter unit, receiver unit	The transmitter unit and receiver unit are in the following condition: ▪ The housings are not damaged ▪ The housing covers are closed and bolted ▪ All of the fixing screws are present.
	The transmitter unit and receiver unit are installed so that the following requirements are met: ▪ The housings do not come into contact with any overpressure in the process gas path ▪ The housings are not improperly heated by the heat generated at the contact point of the process gas path (purging flange).

Checking the electrical system

Test object	Requirement
Cable condition	All cables are undamaged.
Cable types	All connections are made using the specified cable type.
Shielded cables	The shielded cables meet the following requirements: ▪ The cables are fed through metal cable glands ▪ The braided shield is properly connected to the cable gland
Supply voltage	The supply voltage is consistent with the information on the name plate of the junction box.
Connecting cables	All connecting cables meet the following requirements: ▪ The cables are properly installed and secured ▪ The cables in the junction box are connected using the correct pin assignment ▪ The cables in the cable glands are sealed so that no dust can penetrate ▪ All of the unused cable wire ends are insulated or grounded

Test object	Requirement
Cable glands	▪ The cables in the cable glands on the transmitter unit and receiver unit are fitted in a fixed position and cannot move.
Potential equalization	The following devices are connected via a ground cable to the local potential equalization terminal: ▪ Transmitter unit ▪ Receiver unit ▪ Junction box

Checking O-rings and gaskets

The O-rings and gaskets on the flanges are subject to normal wear; the level of wear can vary heavily depending on the operating conditions (especially measuring gas composition and measuring gas temperature). Therefore the condition of the O-rings and gaskets should be checked annually.

Connecting to the instrument software

Instrument software in the web browser

The instrument software is an integral component of the transmitter unit and receiver unit. It is accessed via a web browser.

The Web browsers Mozilla® Firefox® and Google Chrome™ are approved for use with the device software.

Note: Mozilla and Firefox are registered trademarks of the Mozilla Foundation. Chrome is a trademark of Google Inc.

Connecting the devices

Proceed as follows:

Step	Procedure
1	Ensure that transmitter unit and receiver unit are connected to the junction box and ready for operation.
2	Ensure that a PC is connected to the junction box.

Starting the instrument software

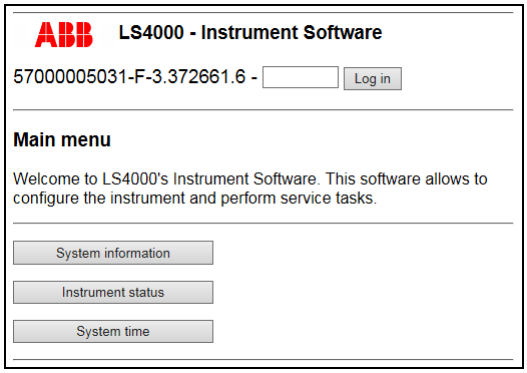
To start the instrument software, you need the IP address of the analyzer.

The factory-set IP address is provided in the analyzer data sheet.

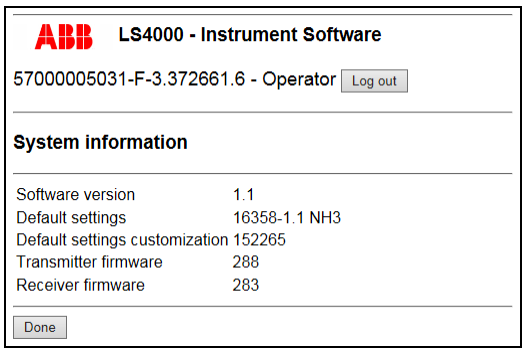
Proceed as follows:

Step	Procedure
1	Start up the PC.
2	Start up the web browser on your computer.
3	In your web browser, type the IP address of the analyzer.

The user interface of the instrument software is displayed:



System information menu



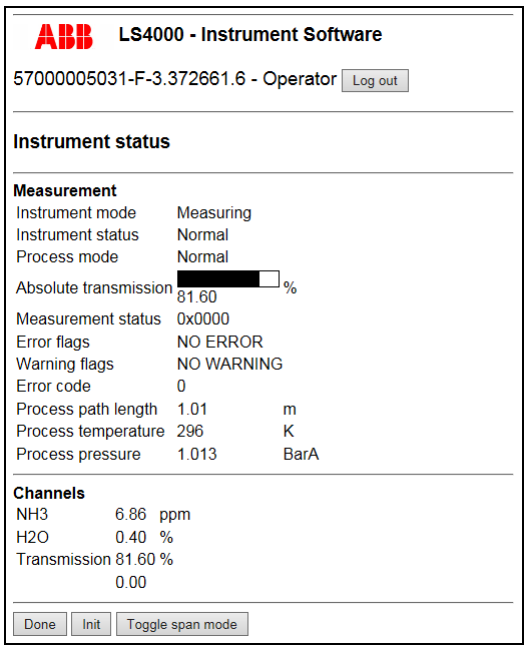
Intended use

View system information

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Software version	Software version of the instrument software
Default settings	Number of standard settings, sample component
Default settings customization	Number of customized standard settings
Transmitter firmware	Firmware version of the transmitter unit
Receiver firmware	Firmware version of the receiver unit
Done	Exit menu

Instrument status menu



Intended use

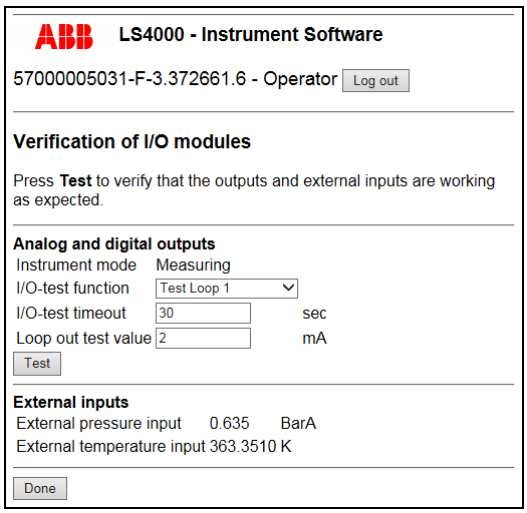
View operating status

View measurements

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Measurement	Measurement
Instrument mode	Operating mode (Initialize, Measure, Fault, Service)
Instrument status	Operating condition (Span, Normal, Init, Calibration, Service)
Process mode	Activity (Normal, Test gas N2 balance, Calibration)
Absolute transmission	Measured transmission value
Measurement status	Status of the measurement process (see page 109)
Error flags	Error message (see page 109).
Warning flags	Warning message (see page 109)
Error code	Error code (see page 110)
Process path length	Length of the measuring section through the process
Process temperature	Process gas temperature
Process pressure	Process gas pressure
Channels	Measuring channels
NH3	Measured value NH_3
H2O	Measured value H_2O
Transmission	Measured value transmission
Done	Exit menu
Init	Refresh the display
Toggle span mode	Pivot the NH_3validation cell in and out (see page 94)

Verification of I/O modules menu



Intended use

Test function of the inputs and outputs

Configure test run

Start test run

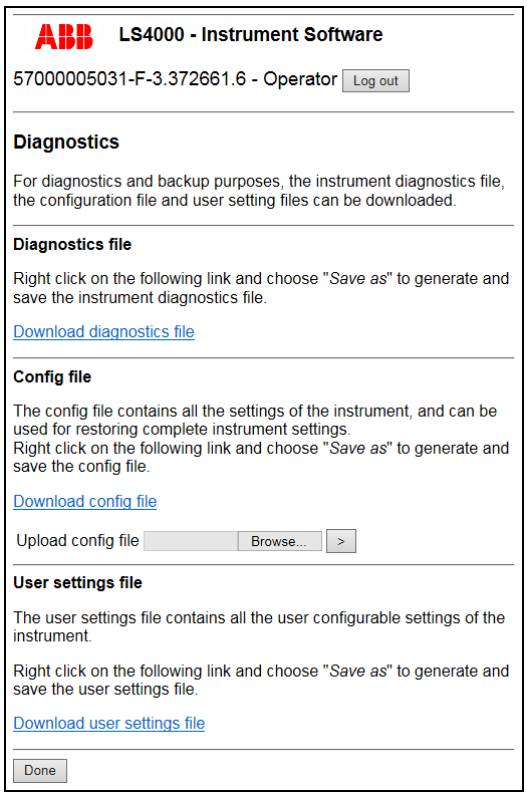
View test result

View measured values from the T/P probes

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Analog and digital outputs	Analog and digital outputs
Instrument mode	Operating condition of the analyzer
I/O-test function	Track results of the test run Example: TEST RELAY 1 CLOSED
I/O-test timeout	Enter the duration of the test run
Loop out test value	Enter a value for simulation of a test result
Test	Start test run
External inputs	External inputs
External pressure input	Value for the pressure as defined in the Installation - Process parameters menu
External temperature input	Value for the temperature as defined in the Installation - Process parameters menu
Done	Exit menu

Diagnostics menu



Intended use

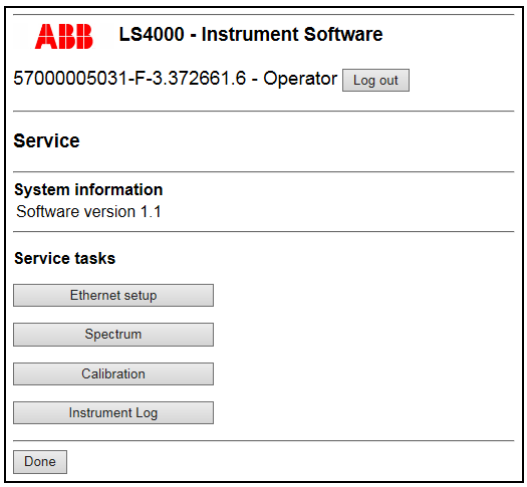
Download and save diagnostic results, configuration data and user settings from the analyzer

Upload saved configuration data to the analyzer

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Download diagnostics file	Download and save diagnosis results from the analyzer
Download config file	Download and save configuration data from the analyzer
Upload config file	Enter the name of a saved configuration file
Browse…	Search for a saved configuration file
>	Upload saved configuration file to the analyzer.
Download user settings file	Download and save user settings from the analyzer
Done	Exit menu

Service menu



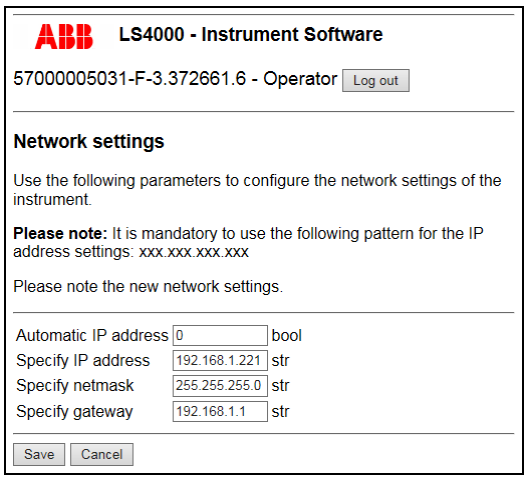
Intended use

Call up the service menus

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Ethernet setup	Call up the Network settings menu (see page 87)
Spectrum	Call up the Spectrum menu (see page 88)
Calibration	Call up the Calibration menu (see page 105)
Instrument Log	Call up the Logging menu (see page 89)
Done	Exit menu

Network settings menu



Intended use

Configure the network

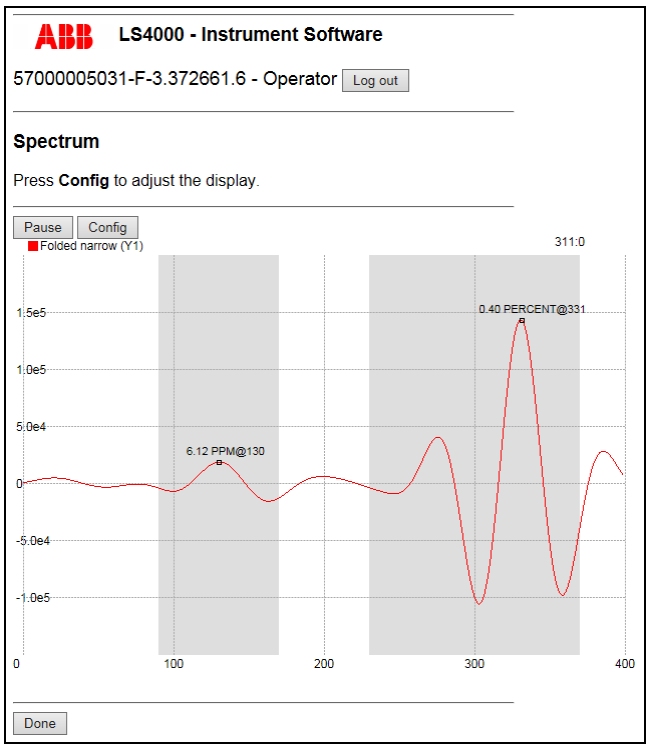
Description

Name	Meaning/function
Log out	Log out and return to the main menu
Automatic IP address	0: Enable entry of a fixed IP address 1: Search DHCP server
Specify IP address	Enter the IP address The factory-set IP address is provided in the analyzer data sheet.
Specify netmask	Enter the netmask
Specify gateway	Enter the gateway
Save	Save settings and exit the menu
Cancel	Cancel the process and exit the menu

Restart the gas analyzer

If the IP address has been changed, a restart of the gas analyzer is required afterwards. To do so, switch off the gas analyzer and power it back up again. Afterwards, the gas analyzer can be reached using the changed IP address.

Spectrum menu



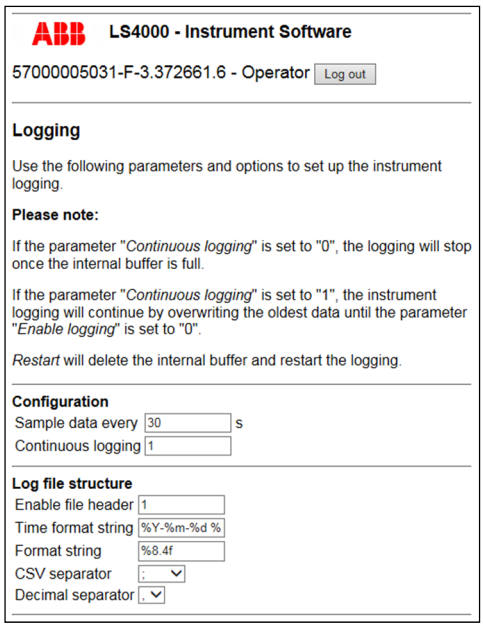
Intended use

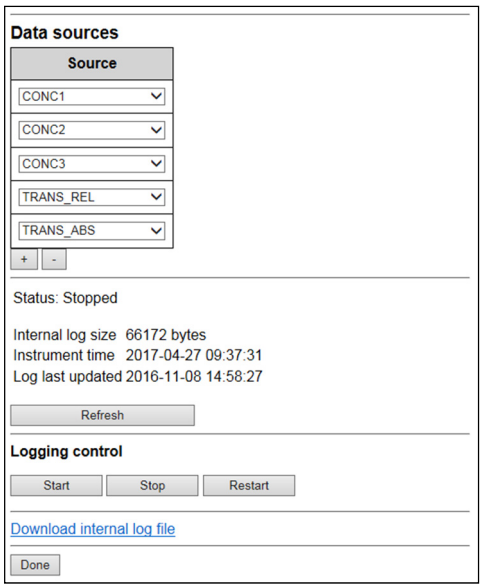
Observe the spectrum (also refer to the section Check absorption lines in the spectrum (see page 96))

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Pause/Start	View the spectrum Pause: View as a still image Start: View in real-time
Config	Customize display of the spectrum
Done	Exit menu

Logging menu





Intended use

Activate or deactivate the measurements log

Define structure and content of the log file

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Configuration	Configuration
Sample data every	Define the frequency of log file updates
Continuous logging	Continuous overwriting of the log file 1: activate or 0: deactivate
Log file structure	Structure of the log file
Enable file header	Header 1: activate or 2: deactivate
Time format string	Define the date and time format
Format string	Define the measured value format
CSV separator	Define the separator for data fields
Decimal separator	Define the decimal separator
Data sources	Data sources
Source	Select measuring channels for entries in the log file
Status	Display of the logging status
Internal log size	Maximum size of the log file
Instrument time	Current date and time in the analyzer
Log last updated	Date and time at which the log file was last updated
Refresh	Update status display
Logging control	Control the logging

Name	Meaning/function
Start	Start logging
Stop	Stop logging
Restart	Restart logging
Download internal log file	Download and save the log file from the analyzer
Done	Exit menu

Validating and calibrating the gas analyzer

Validating the gas analyzer

Preparing for validation

Design

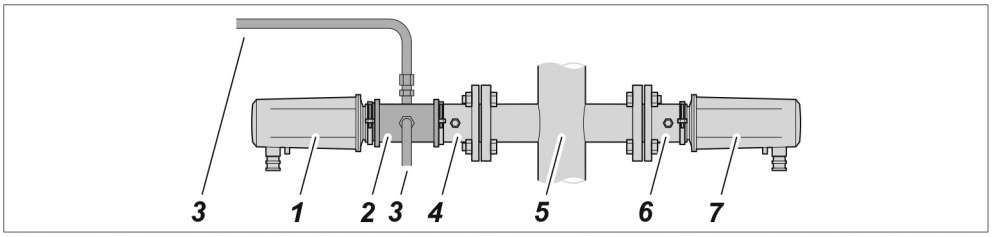
If...	then...
no validation cells are integrated in the process	the validation must be performed on a separate validation set.
validation cells are integrated in the process	the validation can be performed on the process.

Separate validation set

The separate validation set is identical to the calibration set (see section Installing the calibration set (see page 97)).

Validation cell in the process

The diagram shows the positioning of the validation cell in the process:



No.	Meaning
1	Transmitter unit
2	Validation cell
3	Test gas supply and discharge
4	Purging flange
5	Process
6	Purging flange
7	Receiver unit

Proceed as follows:

Step	Procedure
1	Connect a discharge line to the test gas output.
2	Connect a test gas to the test gas input.

Test gas for validation

The validation is used to check the functional capability of the analyzer.

Due to the gasket materials used in the transmitter unit and the receiver unit, it is recommended not to apply test gas with more than 50 ppm NH_3. The following table shows the measured value change which should be achieved depending on the test gas concentration and the process path length (OPL).

Validation with a length of 100 mm

MR	**5 ppm**		**7.5 ppm**		**10 ppm**		**12.5 ppm**	
OPL	c_v	c_t	c_v	c_t	c_v	c_t	c_v	c_t
0.5 m	4	21	6	32	8	42	10	53
1.0 m	4	42	-	-	-	-	-	-

Two validation cells with a total length of 160 mm

MR	**5 ppm**		**7.5 ppm**		**10 ppm**		**12.5 ppm**		**15 ppm**	
OPL	c_v	c_t	c_v	c_t	c_v	c_t	c_v	c_t	c_v	c_t
0.5 m	4	13	6	20	8	26	10	32	12	39
1.0 m	4	26	6	39	8	52	-	-	-	-
1.5 m	4	39	-	-	-	-	-	-	-	-
2.0 m	4	52	-	-	-	-	-	-	-	-

MR Measuring range

OPL Optical path length

c_v resulting total concentration in the process in ppm

c_t concentration of the test gas to be used for validation in ppm

Validation

Validation

Proceed as follows:

Step	Procedure
1	Allow the test gas to flow through the validation cell (flow rate approx. 60 l/hour).
2	Observe the display of the measured value.

If...	then...
the measured value increases	the analyzer is reacting to the measured component contained in the test gas.
the measured value does not increase	the analyzer must be inspected by an authorized service technician.

Since the process measurement continues to run during validation, fluctuations in the display of measured value should be expected; if necessary, the validation should be repeated.

Deviations of ≤ 10% are normal. However, if the value is sharply or repeatedly up-scaled, this may indicate a malfunction of the analyzer; in such a case, the authorized service should be informed.

Step	Procedure
3	During the measuring operation, depending on the application, allow nitrogen or compressed air to flow through the validation cell (flow rate approximately 2-3 l/hr).

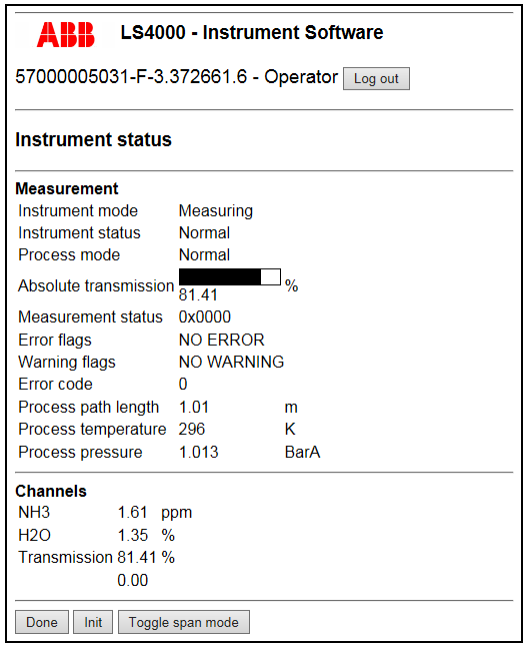
Validate using the internal validation cell

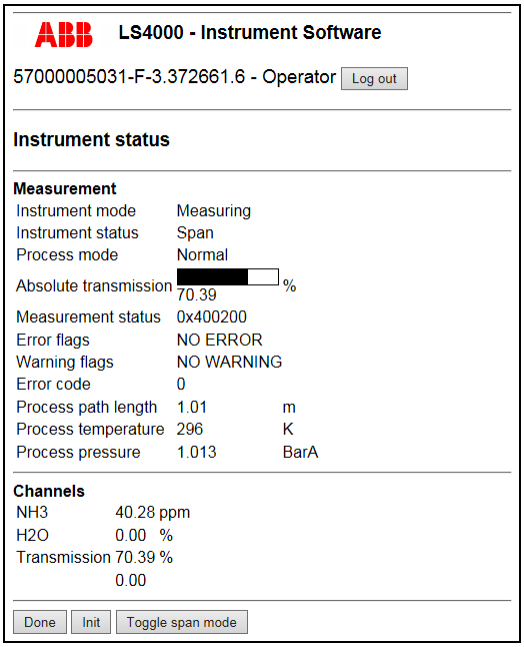
Simplified validation

A validation cell is integrated in the transmitter unit. It can be swiveled into the beam path to easily validate the functioning of the analyzer. The validation cell applied generates an NH_3set point of 80% of the upper range value.

Note: Validation of the sample component H_2O is not required. It is sufficient to check the position of the water line in the spectrum (see section Check absorption lines in the spectrum (see page 96)).

Proceed as follows:

Step	Procedure
	Prerequisite: The connection to the instrument software is established and the user is logged in as Operator.
1	In the main menu, click on “Instrument status”. The Instrument status menu is displayed.  The measured value now displayed for NH3 (1.61 ppm in the example) will be automatically subtracted from the measured value displayed later (see step 2).

Step	Procedure
2	Click on "Toggle span mode". The internal validation cell is swiveled into the beam path. This process lasts a few seconds.  The measured value before the validation cell was swiveled in is automatically subtracted (see step 1) from the now displayed measured value for NH3 (40.28 ppm in the example).

If...	then...
the measured value for NH3 does not differ by more than ± 10% from the set point,	the analyzer is reacting correctly to the sample component contained in the validation cell.
the measured value for NH3 differs by more than ± 10% from the set point,	the analyzer must be inspected by an authorized service technician.

The prerequisite for the correct display of measured value after the validation cell is swiveled in is that the proportion of NH_3in the process gas is as stable as possible.

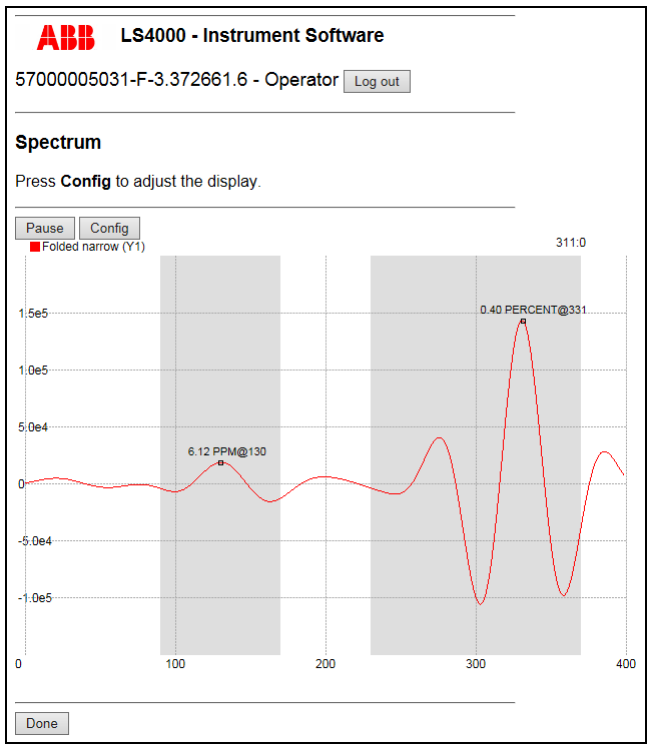
The measured value for the transmission is lower with a validation cell swiveled in than with a validation cell swiveled out (in the example 70.39% compared to 81.41%).

Step	Procedure
3	Click on "Toggle span mode". The internal validation cell is swiveled out of the beam path. This process lasts a few seconds.
4	Click on “Done” to exit the menu. The analyzer returns back to normal measuring mode.

Checking absorption lines in the spectrum

Functional testing

To test the functioning of the analyzer, you can check the positions of the absorption lines in the spectrum. Proceed as follows:

Step	Procedure
	Prerequisite: The connection to the instrument software is established and the user is logged in as Operator. If there is no water in the process gas, the purging flanges need to be purged with compressed air or with ambient air.
1	In the main menu, click on “Service”. The "Service" menu is displayed.
2	Click on "Spectrum" in the "Service" menu. The "Spectrum" menu is displayed.  Checking the position of the water line in the spectrum: The H_2O line can be found in the right-hand gray-shaded area of the spectrum. The marking on the top shows the current measured value of the H_2O component, as well as the position of the line in the spectrum. If the position is not at 330±1, the analyzer should be inspected by an authorized service technician. Checking the position of the ammoniac line in the spectrum: The NH_3 line can be found in the left-hand gray-shaded area of the spectrum. The marking on the top shows the current measured value of the NH_3 component, as well as the position of the line in the spectrum. If the position is not at 130±1, the analyzer should be inspected by an authorized service technician.
3	Click on “Done” to exit the menu. The analyzer returns back to normal measuring mode. Make sure that purging flanges are purged.

Calibrating the gas analyzer

Installing the calibration set

Calibration gas

For calibration with NH_3, the calibration cell made from stainless steel (AISI 316L) should be used.

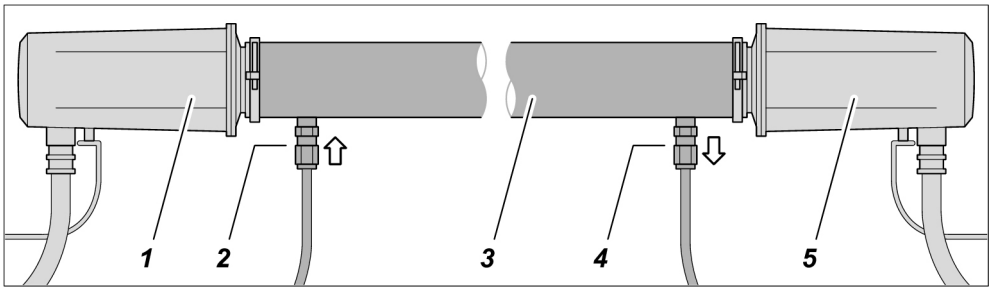
For the calibration gas, a gas mixture that contains the measured component in the same concentration as in the process gas must be used. The pressure and temperature must correspond to the ambient conditions.

The flow rate of the calibration gas should be set to approx. 60 l/hr. When using dry NH_3, the running-in time is at least 30 minutes.

Calibration set

The calibration is not performed on the process, but instead on a separate calibration set.

The diagram shows the calibration set:



No.	Meaning
1	Transmitter unit
2	Calibration gas input
3	Calibration cell, length: 70 cm
4	Calibration gas output
5	Receiver unit

Preparing the calibration set

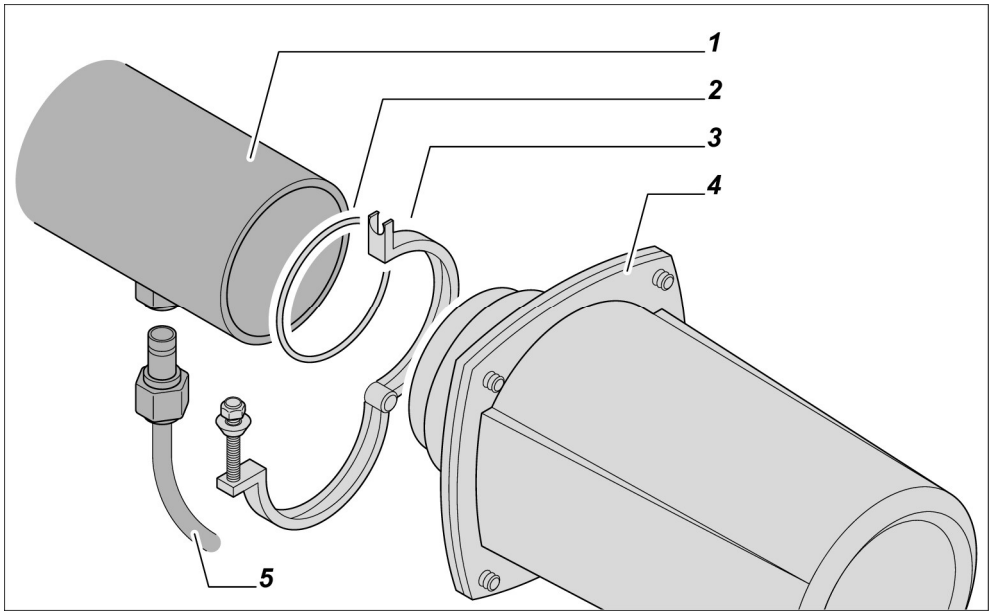
Class I infrared laser beam invisible to the human eye.
Danger of eye injuries when looking into the laser beam.
Disconnect the transmitter unit from the supply voltage.

Proceed as follows:

Step	Procedure
1	Disconnect the analyzer from the supply voltage.
2	Disassemble the transmitter unit and the receiver unit from the process. Make sure that no process gas is able to leak out of the purging flanges.

Installing the calibration set

The transmitter unit and receiver unit are installed using exactly the same steps.



No.	Meaning
1	Calibration cell, length: 70 cm
2	Purging flange flat gasket
3	Clamp
4	Transmitter unit or receiver unit
5	Calibration gas input or output

Proceed as follows:

Step	Procedure
1	Place the purging flange flat gasket in the groove of the calibration cell.
2	Place the transmitter unit or the receiver unit onto the front side of the calibration cell.
3	Attach the transmitter unit and the receiver unit using the clip.

Establishing the connections

Proceed as follows:

Step	Procedure
1	Connect the supply voltage to the analyzer.
2	Connect the calibration gas to the calibration gas input.
3	Connect a discharge line to the calibration gas output.
4	Open the junction box.
5	Connect a PC to the junction box (see section Connecting a PC to the junction box (see page 55)).

The analyzer is now ready for the calibration process.

Temporarily changing the configuration

Preface

Only the NH_3 sample component needs to be calibrated; it is performed using the instrument software.

Given the measuring principle, the H_2O sample component does not need to be calibrated. The process of checking the position of the water line in the spectrum is explained in section Checking absorption lines in the spectrum (see page 96).

Starting the instrument software

Proceed as follows:

Step	Procedure
1	Start up the PC.
2	Start up the web browser on your computer.
3	In your web browser, type the IP address of the analyzer. The connection to the instrument software is now established. The Main menu is displayed.

Logging in

Proceed as follows:

Step	Procedure
1	Enter the operator password. The operator password is "xs2ls".
2	Click on "Log in". You are now logged in as an operator. The expanded Main menu is displayed.

Adjusting the configuration

For the calibration process, you must temporarily change the configuration of the analyzer.

Once the calibration process is completed, the original configuration must be restored.

In order to facilitate restoration of the original configuration, choose one of the following methods:

- Make a note of the original settings before each change.
- Before each change, save a screenshot of the original settings.

Installation procedure menu

Step	Procedure
1	Click on "Installation". The Installation procedure menu (see page 63) is displayed.
2	Click on "Next" to start the configuration routine. The Installation - Cable length menu (see page 64) is displayed.

Installation - Cable length menu

Step	Procedure
3	Leave all values unchanged.
4	Click on "Next". The Installation - Process parameters menu (see page 65) is displayed.

Installation - Process parameters menu

Make the following settings:

Process path length	see the following clarifications
Pressure input	FIXED
Temperature input	FIXED
Fixed pressure level	Enter the pressure value
Fixed temperature level	Enter the temperature value
Enable process broadening	No

Clarifications regarding the "process path length" parameter

Due to the gasket materials used in the transmitter unit and the receiver unit, it is recommended not to apply test gas with more than 50 ppm NH_3.

To be able to perform calibration for measuring ranges > 50 ppm NH_3, the standard process path length (OPL) of 0.7 m needs to be appropriately reduced at a consistent test gas concentration of 40 ppm NH_3.

In the process, the product of the OPL and $c_{meas.value}$ must always amount to ≤ 0.7 * 40 ppm * m. Specified in the following table are:

- Concentration of the test gas $c_{test\ gas}$ and
- the process path length OPL to be entered for 80% of the measuring range, as well as
- the resulting total concentration $c_{meas.value}$

Measuring range	$c_{test\ gas}$	OPL	$c_{meas.value}$
≤ 20 ppm	16 ppm	0.7 m	16 ppm
≤ 50 ppm	40 ppm	0.7 m	40 ppm
≤ 100 ppm	40 ppm	0.35 m	80 ppm
≤ 200 ppm	40 ppm	0.175 m	160 ppm

Step	Procedure
5	Leave the other settings unchanged.
6	Click on "Next". The Installation - Installation flanges menu (see page 67) is displayed.

Installation - Installation flanges menu

Make the following settings:

Total flange path length	0 (zero) m
Concentration in flanges	0 (zero) %

Step	Procedure
7	Leave the other settings unchanged.
8	Click on "Next". The Installation - Ambient conditions menu (see page 69) is displayed.

Installation - Ambient conditions menu

Step	Procedure
9	Leave all values unchanged.
10	Click on "Next". The Installation - Channels menu (see page 70) is displayed.

Installation - Channels menu

Step	Procedure
11	Leave all values unchanged.
12	Click on "Next". The Installation - Analog and digital outputs menu (see page 72) is displayed.

Installation - Analog and digital outputs menu

Step	Procedure
13	Leave all values unchanged.
14	Click on "Next". The Installation - Save settings menu (see page 74) is displayed.

Installation - Save settings menu

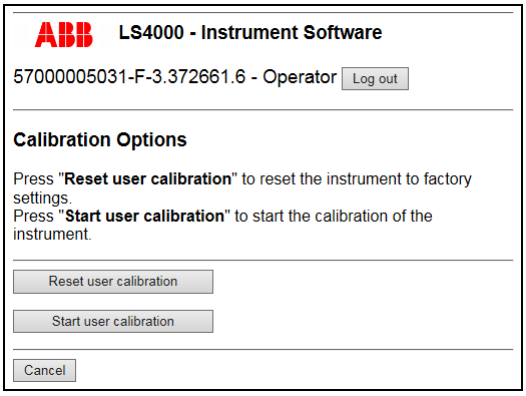
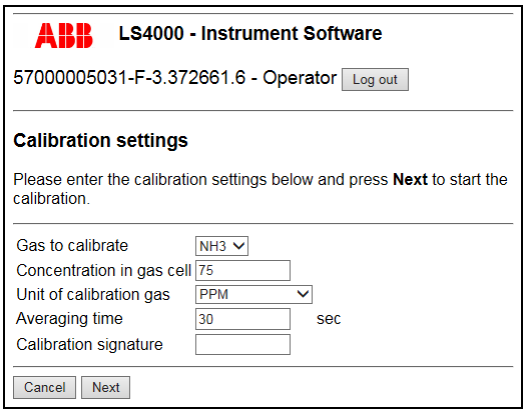
Step	Procedure
15	Check all the settings.

If...	then...
a setting is incorrect	the configuration routine must be repeated. To repeat the adjustment of the configuration, click on "Cancel". All changes are discarded. The Installation procedure menu is displayed. Repeat the configuration routine.
all settings are correct	Click on "Save". The settings are saved. The Main menu is displayed. The analyzer is ready for calibration.

Calibration

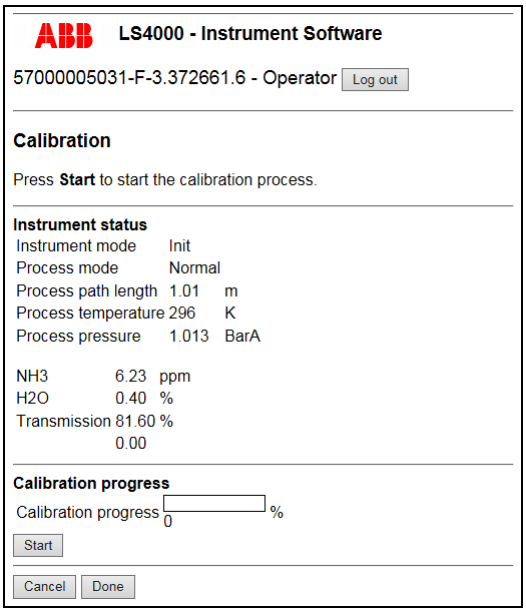
Opening the calibration menu

Proceed as follows:

Step	Procedure
1	Click on "Service". The Service menu (see page 86) is displayed.
2	Click on "Calibration". The Calibration options menu (see page 105) is displayed. 
3	Click on "Start user calibration". The Calibration settings menu (see page 106) is displayed. 

Entering calibration data

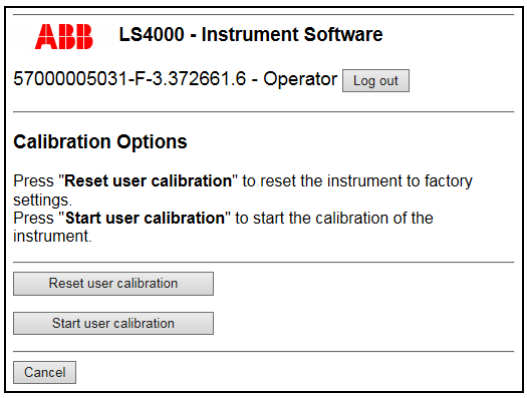
Step	Procedure	
4	Enter the parameters for the calibration procedure:	
	Gas to calibrate	Calibration gas (NH3)
	Concentration in gas cell	Calibration gas concentration in the calibration cell
	Unit of calibration gas	Unit for displaying the calibration gas concentration (ppm for NH3)
	Averaging time	Measuring duration for determining the average value (typically 30 s, max. 60 s.)
	Calibration signature	User name (this entry is optional)

Step	Procedure
5	Click on "Next". The Calibration menu (see page 107) is displayed. 

Performing calibration

Step	Procedure
6	Allow the calibration gas to flow through the calibration cell (flow rate approx. 60 l/hr).
7	Observe the display of measured value. When the measured value is stable, click on "Start". The calibration process starts.
8	Read the measurements taken during the calibration process.
9	Observe the progress bar that displays the progress of the calibration process. When the progress bar shows 100 %, the calibration process is complete.
10	Click on "Done". The Main menu is displayed.
11	Disassemble the calibration set. Resume measuring mode.

Calibration options menu



Intended use

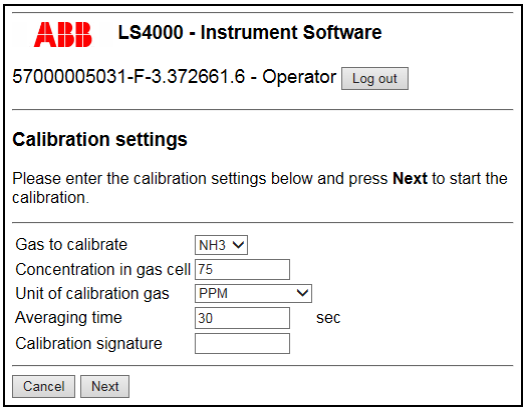
Start calibration

Reset calibration to factory settings

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Reset user calibration	Reset calibration to factory settings
Start user calibration	Call up the Calibration settings menu (see page 106).
Cancel	Exit menu

Calibration settings menu



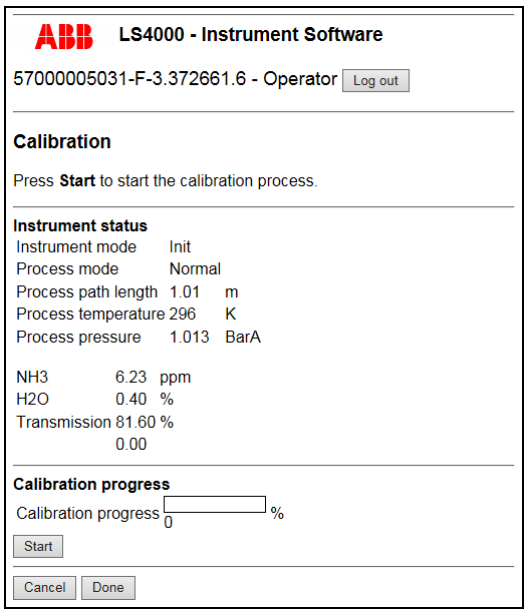
Intended use

Enter parameters for the calibration process

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Gas to calibrate	Select calibration gas
Concentration in gas cell	Enter the calibration gas concentration in the calibration cell
Unit of calibration gas	Select the unit for displaying the calibration gas concentration
Averaging time	Enter the measurement duration for determining the average value
Calibration signature	Enter a user name (optional)
Cancel	Exit menu
Next	Call up the Calibration menu (see page 107)

Calibration menu



Intended use

View operating status

Start calibration process

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Instrument status	Instrument status:
Instrument mode	Operating condition
Process mode	Activity
Process path length	Process path length (Enter in Installation - Process parameters menu)
Process temperature	Process gas temperature (Enter in Installation - Process parameters menu)
Process pressure	Process gas pressure (Enter in Installation - Process parameters menu)
NH3	Calibration gas concentration (NH_3)
H2O	Calibration gas concentration (H_2O)
Transmission	Transmission value
Calibration progress	Calibration process
Calibration progress	Progress of the calibration process
Start	Start calibration process
Cancel	Cancel the calibration process
Done	Exit menu

Continuing measuring mode

Disassembling the calibration set

⚠ **Class I infrared laser beam invisible to the human eye.**
Danger of eye injuries when looking into the laser beam.
Disconnect the transmitter unit from the supply voltage.

Proceed as follows:

Step	Procedure
1	Disconnect the analyzer from the supply voltage.
2	Disconnect the discharge line from the calibration gas output.
3	Disconnect the calibration gas from the calibration gas input.
4	Remove the transmitter unit and the receiver unit from the calibration cell.

Attaching and connecting the components to the process

Proceed as follows:

Step	Procedure
1	Install the transmitter unit and the receiver unit back on the process (see Installing the transmitter unit and receiver unit (see page 36)). New self-locking nuts must be used for mounting on the process.
2	Check the analyzer in accordance with the checklists in section Checking and approving the gas analyzer (see page 51).
3	Re-connect the analyzer to the supply voltage.

Restoring the configuration

Proceed as follows:

Step	Procedure
1	Restore the original configuration in the configuration routine (see Temporarily changing the configuration (see page 100)).
2	Close the web browser.
3	Shut down the PC.
4	Disconnect the PC from the junction box by disconnecting the adapter board from the terminal strip.
5	Close the junction box. The analyzer is ready to use again.

Recognizing and resolving errors

Error messages in "Measuring" mode

Measurement status	Meaning and cause	How to resolve the error
0x001	LOW_TRANSMISSION_WARNING The transmission of the laser beam is not sufficient to evaluate the measurement results.	▪ Clean all optical components through which the laser beam passes ▪ Check and correct the alignment of the transmitter unit in relation to the receiver unit
0x004	TEMP_ERROR The instrument has recognized an unstable temperature in the transmitter unit or receiver unit.	▪ If the error occurs repeatedly or continuously: Have the error resolved by authorized service personnel
0x008	BEAM_BLOCK_ERROR The laser beam does not reach the receiver unit.	▪ Clean all optical components through which the laser beam passes ▪ Remove any foreign matter that may be present and that may interrupt the transmission of the laser beam ▪ Check and correct the alignment of the transmitter unit in relation to the receiver unit
0x010	BEAM_BLOCK_WARNING The laser beam is sometimes not able to reach the receiver unit.	▪ Remove any foreign matter that may be present and that may interrupt the transmission of the laser beam ▪ Check that the transmitter unit and receiver unit are securely installed
0x020	CHECKSUM_ERROR Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit
0x040	TIMING_ERROR The analyzer is overloaded.	▪ Reduce the measurement period for determining the average value
0x080	SAMPLING_OVERFLOW_ERROR Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit
All others	Unknown or cannot be resolved on your own	▪ Inform authorized service personnel of the error code

Error messages in "Malfunction" status

Malfunction operating condition

The analyzer goes into the “Malfunction” operating condition if an error occurs during initialization of the analyzer. Since the analyzer runs through the initialization routine several times, it can take up to five minutes until the analyzer switches to the “Malfunction” operating condition.

The analyzer goes into the “Malfunction” operating condition if an error occurs in the “Measuring” operating condition and an initialization has therefore been launched.

The analyzer can quit the “Malfunction” operating condition only if the error has been eliminated (see following table), and is no longer pending during the subsequent initialization.

Error code	Meaning and cause	How to resolve the error
3	MEMORY ALLOC FAILURE The internal measured value memory is full.	▪ Shut down the analyzer. ▪ Restart the analyzer.
8	ERROR INITIALIZING RX UNIT Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit.
9	SYSTEM IS UNCONFIGURED The analyzer is not fully configured.	▪ Configure the analyzer using the device software.
10	SETTINGS IS CORRUPTED The analyzer is not configured correctly.	▪ Correct the configuration of the analyzer using the device software.
11	SETTINGS OUT OF BOUNDS The configuration contains parameters that are outside the permitted value ranges.	▪ Correct the configuration of the analyzer using the device software.

13	TEMP REG. TIMEOUT
	The temperature in the transmitter unit or in the receiver unit may be too high because the temperature regulation failed.
		▪ Cool the unit using one of the following methods:
		  ▪ Shielding from the heat source
		  ▪ Improving the air circulation

14	BEAM BLOCK The laser beam does not reach the receiver unit.	▪ Clean all optical components through which the laser beam passes ▪ Remove any foreign matter that may be present and that may interrupt the transmission of the laser beam ▪ Check and correct the alignment of the transmitter unit in relation to the receiver unit

Error code	Meaning and cause	How to resolve the error
17	LINE TRACKING FAILURE The analyzer has detected a spectroscopy error with one of the following causes: ▪ Unknown process gas in process ▪ Incorrect wavelength ▪ The operating temperature of the transmitter unit is outside the permitted range ▪ Analyzer malfunction	▪ Disconnect the analyzer from the supply voltage. Apply test gas (in the process or in a validation cell). For the test gas, use a gas mixture that contains the measured component in a concentration suitable for generating a significant change in the measured value display. Initialize the analyzer. ▪ If the error message occurs again, contact the authorized service personnel.
21	RX WRITE FAIL Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit
22	RX READ FAIL Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit
24	TX FIRMWARE TOO OLD The transmitter unit has an earlier version of the firmware that is not compatible with the device software.	▪ Contact the authorized service personnel.
25	TX FIRMWARE TOO NEW The transmitter unit has a later version of the firmware that is not compatible with the device software.	▪ Contact the authorized service personnel.
26	RX FIRMWARE TOO OLD The receiver unit has an earlier version of the firmware that is not compatible with the instrument software.	▪ Contact the authorized service personnel.
27	RX FIRMWARE TOO NEW The receiver unit has a later version of the firmware that is not compatible with the instrument software.	▪ Contact the authorized service personnel.
30	DMA RAMP TRANSFER Data transmission between the transmitter unit and receiver unit is disrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit
32	LASER TEMP TOO HIGH The temperature in the transmitter unit or in the receiver unit has exceeded the maximum permitted value.	▪ Cool the unit using one of the following methods: ▪ Shielding from the heat source ▪ Improving the air circulation ▪ If the error message persists or a significantly incorrect measurement result is displayed, contact the authorized service personnel.
All others	Unknown or cannot be resolved on your own	▪ Inform authorized service personnel of the error code

Gas analyzer shutdown

Ending operation and shutting down the gas analyzer

Ending operation

Proceed as follows:

Step	Procedure
1	Disconnect the analyzer from the supply voltage.

Shutting down the gas analyzer

Proceed as follows:

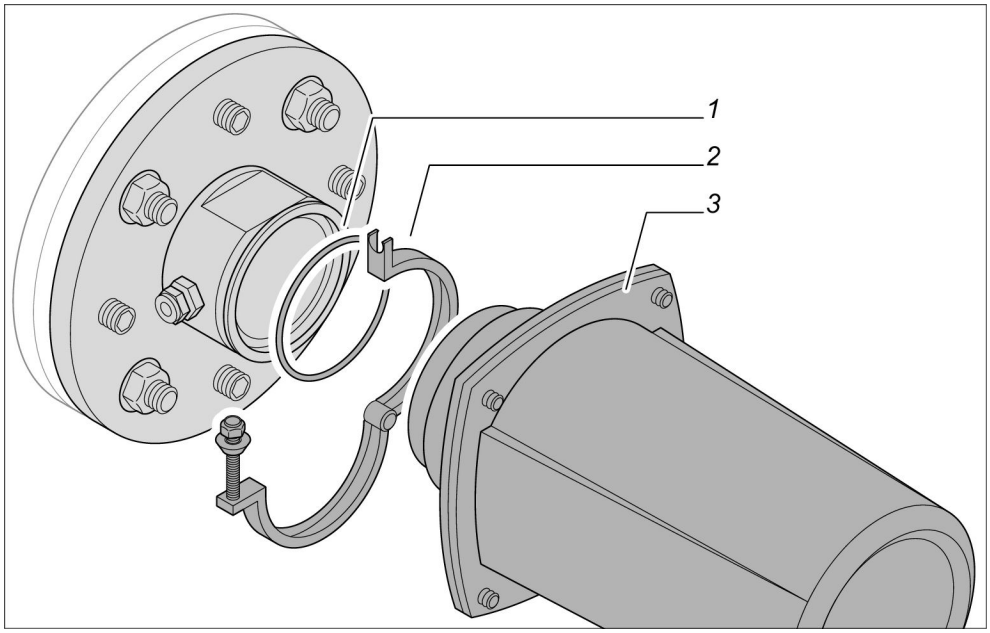
Step	Procedure
1	Disconnect the transmitter unit from the junction box.
2	Disconnect the transmitter unit from the potential equalization terminal.
3	Disconnect the receiver unit from the junction box.
4	Disconnect the receiver unit from the potential equalization terminal.

Disassembling the gas analyzer

Disassembling the transmitter unit and receiver unit

Before uninstalling, shut down the analyzer (see Ending operation and shutting down the gas analyzer (see page 112).

The transmitter unit and receiver unit are dismantled using exactly the same steps.



No.	Meaning
1	Purging flange flat gasket
2	Clamp
3	Transmitter unit or receiver unit

Disassemble the transmitter unit and receiver unit as follows:

Step	Procedure
1	Hold the transmitter unit or the receiver unit firmly.
2	Loosen and remove the clamp ***2*** of the transmitter unit or the receiver unit.
3	Remove the transmitter unit or receiver unit from the purging flange.
4	Remove the purging flange flat gasket ***1*** from the groove of the purging flange.
5	Disassemble the purging flanges and close the installation flange openings.

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