ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

LS4000, LS4060

Diode laser analyzers

Version for measuring O_2

General purpose and explosion-proof variants

Highest precision under harshest conditions

Measurement made easy

Contents

Preface

Contents of the operating instruction

This operating instruction contains all the information you need to install and operate the analyzer in a safe manner and as intended.

In addition to this operating instruction, please also note the analyzer data sheet that accompanies each 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, letters and numbering used in the operating instruction

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

Indicates specific information on the operation of the analyzer as well as on the use of this operating instruction.

1, 2, 3, … Indicate reference numbers used within figures.

Safety instructions

Intended use

The analyzer is designed to measure gas concentrations in a gas mixture.

Improper use

The analyzer is not designed or suitable for other purposes.

Any use for any other purpose is concerned an improper use.

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.**

Safety when repairing and disassembling explosion-proof variants

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

The transmitter unit, receiver unit and junction box must not be opened in the presence of an explosive atmosphere.

The transmitter unit, receiver unit and junction box must not be disassembled in the presence of an explosive atmosphere.

Repairs to connection points on the transmitter and receiver unit which are relevant to explosion protection are not allowed.

Certification of analyzer components

⚠ **The ABB certificates regarding safety and electromagnetic compatibility relate to the transmitter unit, the receiver unit and the junction box.**

The ABB certificates regarding explosion protection relate to the transmitter unit and the receiver unit. The current certificates and safety instructions of the relevant manufacturer must be observed with regard to the junction box and its installation. These are available on the manufacturer's website. Please refer to the relevant data on the name plate of the junction box.

Warning symbols on the junction box

Risk of electric shock!

Applied safety standards

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

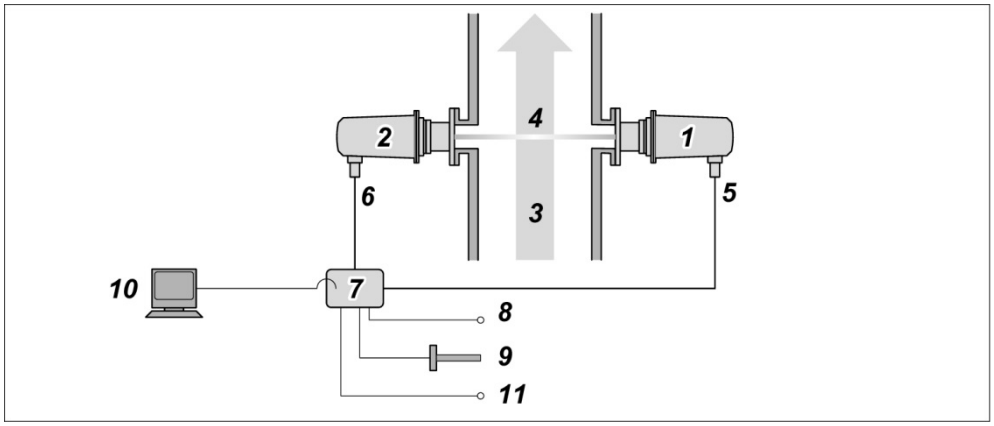
Description

Analyzer variants

Variant	Type	Certificate	Power supply in the junction box
General Purpose	LS4000		Always installed
ATEX Zone 1 and Zone 2	LS4060	BVS 13 ATEX E 008 X	Fitted or not included
IECEx Zone 1	LS4060	IECEx BVS 13.0013X	Fitted or not included
KCs	LS4060	15-AV4BO-0281, 15-AV4BO-0282	Not included
CSA Class I, Div. 1 & Div. 2, CSA Class I, Zone 1	LS4060	12.2589676X	Always installed

The certificates of the analyzer do not apply to the junction box of the respective variant. When installing and operating the junction box, please note the certificate and, if applicable, the operating instructions of the relevant manufacturer.

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
- Depending on design: External power supply unit (see Analyzer variants on page 10)

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.

Explosion-proof variants of the junction boxes (manufacturer's part numbers)

Variant	ABB P/N	Manufacturer's P/N
ATEX, IECEx, KCs without power supply	758368	Bartec 07-5100-2002/3011
ATEX with power supply	758255	Bartec (Ex-e) 07-5180-2002/3011 Cortem (Ex-d) GUB-02
IECEx with power supply	758308	Bartec (Ex-e) 07-5180-2002/3011 Cortem (Ex-d) GUB-02
CSA Div. 1 with power supply	758219	R. Stahl 8264/6214-3210

General Purpose variant: Description

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 site	Suitable for outdoor use
Ambient temperature	Operation: –20 to +55 °C, Storage: –40 to +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 to 32 V)
Total power consumption	Max. 10 W
Housing protection type	IP65
Protection class	III

Gas mixture

The General Purpose variant may be used for measuring a flammable gas mixture, i.e. the laser beam may pass through a flammable gas mixture, if the following conditions are met:

- The laser beam must never pass through an explosive gas mixture.
- The gas analyzer must be de-energized when an explosive gas mixture is present.

When the laser beam shall pass through an explosive gas mixture, an explosion-proof variant of the gas analyzer with type test certificate must be used.

Junction box

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

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100–240 V ± 10 %; 50 to 60 Hz
Power consumption	30 VA
Protection class	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 N.O. contacts 30 V/1 A DC/AC; wired in accordance with the requirements for class 2 circuits [1)]
Service port	Ethernet 10BaseT

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 EMC

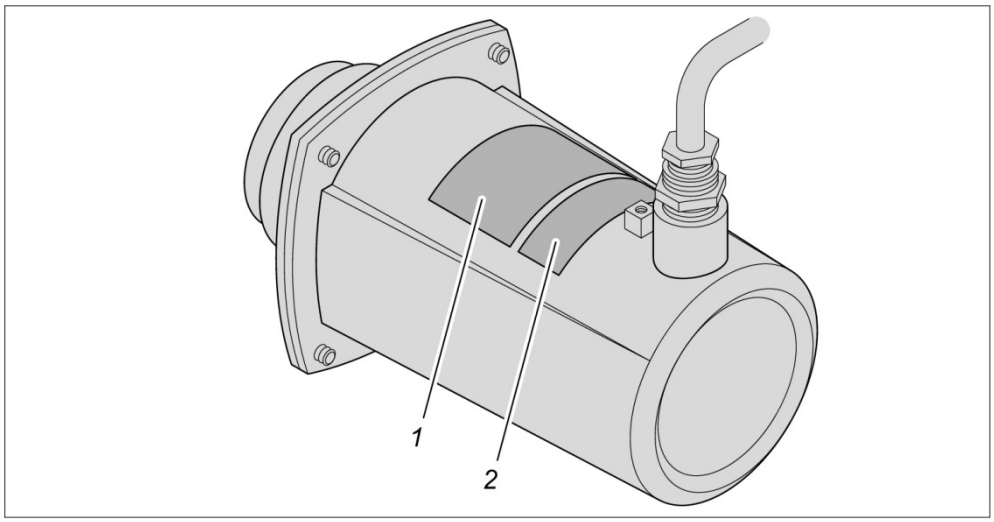
Safety in accordance with European standards – CE	Tested to EN 61010-1:2010
Safety in accordance with U.S. and Canadian standards – UL, CSA	The LS4000 and LS4060 gas analyzers are certified for use in "General Purpose" environments. They comply with the standards CAN/CSA-C22.2 No. 61010-1-12 and UL Std. No. 61010-1 (3rd Edition).
EMC: Interference immunity	Tested to EN 61326-1:2013 Inspection level: Industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.
EMC: Emission interference	Tested to EN 61326-1:2013 Limit class B for interference field strength and interference voltages is met.

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

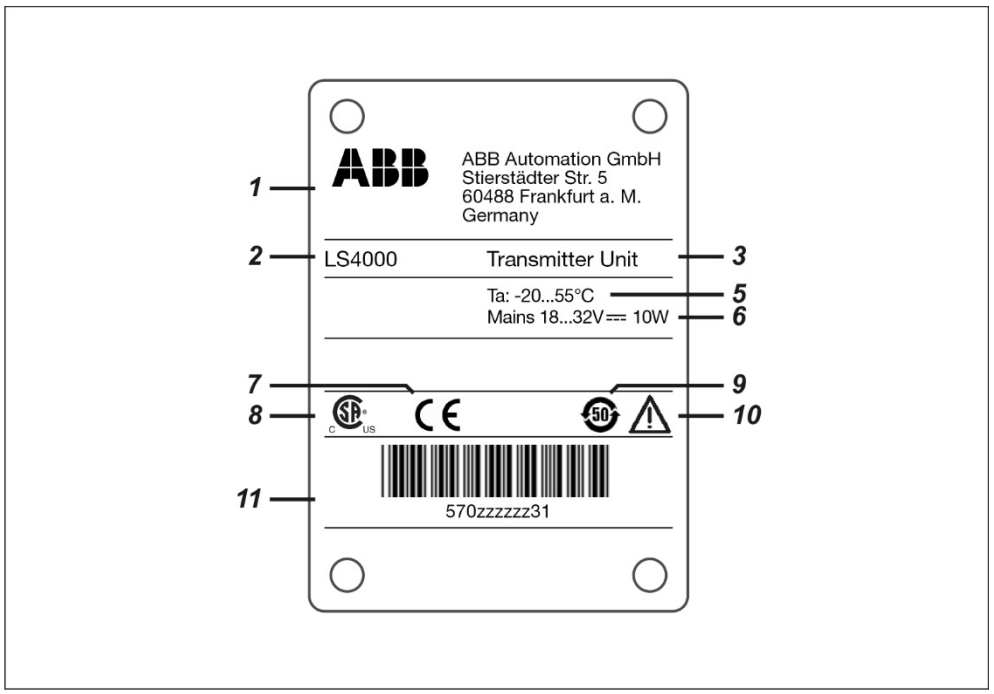
Transmitter unit and receiver unit: Position of labels



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.



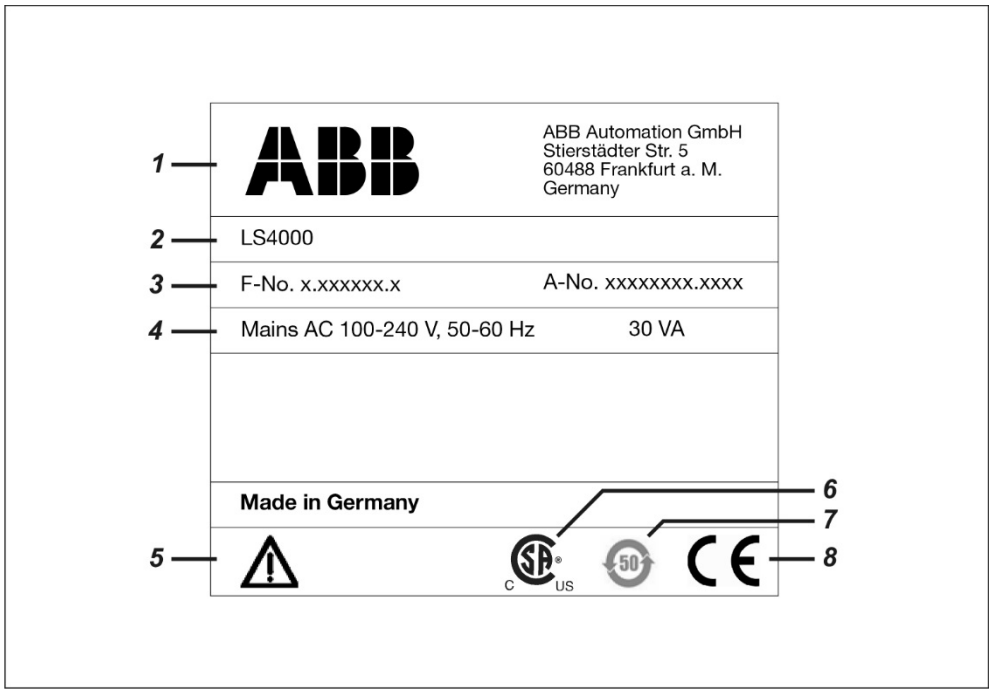
No.	Meaning
1	Details of the manufacturer
2	Model name
3	Transmitter unit, receiver unit
5	Permissible ambient temperature for operation
6	Supply voltage and power consumption
7	CE mark
8	CSA marking
9	EFUP marking (EFUP = environment friendly use period): 50 years of operating time in accordance with the EU's RoHS Directive without any leaks of substances hazardous to health or the environment under normal conditions of use
10	Symbol: Consult operating instruction
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
5	Symbol: Consult operating instruction
6	CSA marking
7	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
8	CE mark

Scope of 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.

Qty.	Description
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 & technical documentation"
	Accessories included as per customer order

Disposing of packaging material

Keep the transport packaging of the transmitter and receiver units for possible return. Keep the yellow protective caps of the lenses for service purposes. Dispose of the residual 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.

ATEX variant: Description

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 site	Suitable for outdoor use Operation only under atmospheric conditions according to IEC 60079-0 (limited temperature range, see below)
Ambient temperature	Operation: −20 to +55 °C, Storage: −40 to +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 to 32 V)
Total power consumption	Max. 10 W
Housing protection type	IP65
Protection class	III

Junction box (without power supply unit)

Specifications	
Dimensions (W x H x D)	300 x 230 x 111 mm
Weight	4.5 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: −20 to +55 °C

Junction box with integrated power supply

Specifications	
Dimensions (W x H x D)	230 x 461 x 165 mm
Weight	10 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: −20 to +55 °C

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100–240 V ± 10 %; 50 to 60 Hz
Power consumption	30 VA
Protection class	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 N.O. contacts 30 V/1 A DC/AC; wired in accordance with the requirements for class 2 circuits [1)]
Service port	Ethernet 10BaseT

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 EMC

Safety in accordance with European standards – CE	Tested to EN 61010-1:2010
EMC: Interference immunity	Tested to EN 61326-1:2013 Inspection level: Industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.
EMC: Emission interference	Tested to EN 61326-1:2013 Limit class B for interference field strength and interference voltages is met.

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.

If the junction box is set up outdoors, measures must be taken where necessary to ensure the intended operation. This may include rain canopies, for example, or housings with an adequate IP rating.

Safety rating

Preliminary remarks

⚠ **The specified explosion protection is only guaranteed when used for its intended purpose.**

Transmitter unit and receiver unit: Explosion protection for zone 1

The transmitter unit and receiver unit are certified for use in explosive atmospheres as follows:

Classification	Environment	EC type examination certificate
II 2(1)G Ex d [op is Ga] IIC T6 Gb	Environment with explosive gases	BVS 13 ATEX E 008X
II 2D Ex tb IIIC T88°C Db	Environment with explosive dusts	BVS 13 ATEX E 008X

The measurement function for the explosion protection is not the subject of the EC type examination certificate.

Transmitter unit and receiver unit: Explosion protection for zone 2

The transmitter unit and receiver unit are certified for use in explosive atmospheres as follows:

Classification	Environment	Certificate
II 3(1)G Ex d [op is Ga] IIC T6 Gc	Environment with explosive gases	BVS 13 ATEX E 008X
II 2D Ex tb IIIC T88°C Db	Environment with explosive dusts	BVS 13 ATEX E 008X

Junction box: Safety classification for zone 1 and zone 2

The junction box is certified for use in potentially explosive environments as follows:

Classification	Environment	EC type examination certificate
II 2G Ex e IIC T6 Gb II 2G Ex d IIC T6 Gb	Environment with explosive gases	PTB 11 ATEX 1016 X DEKRA 13 ATEX 0209
II 2D Ex tb IIIC T80°C Db II 2D Ex tb IIIC T80°C Db	Environment with explosive dusts	PTB 11 ATEX 1016 X DEKRA 13 ATEX 0209

Binding information: See name plate and manufacturer's EC type examination certificate.

Laser classification

Laser classification

The laser beam comes into contact with the gas being analyzed.

The gas analyzer may be used for analysis of one of the following media:

Medium	Zone	Classification
Explosive gases	Zone 0	IIC T6
Explosive dusts	Zone 21	IIIC T88°C

⚠ **The laser analyzer is not approved for the analysis of media that contain a mixture of explosive gases and dusts.**

Safely separate the installation location of the gas analyzer from zone 0.

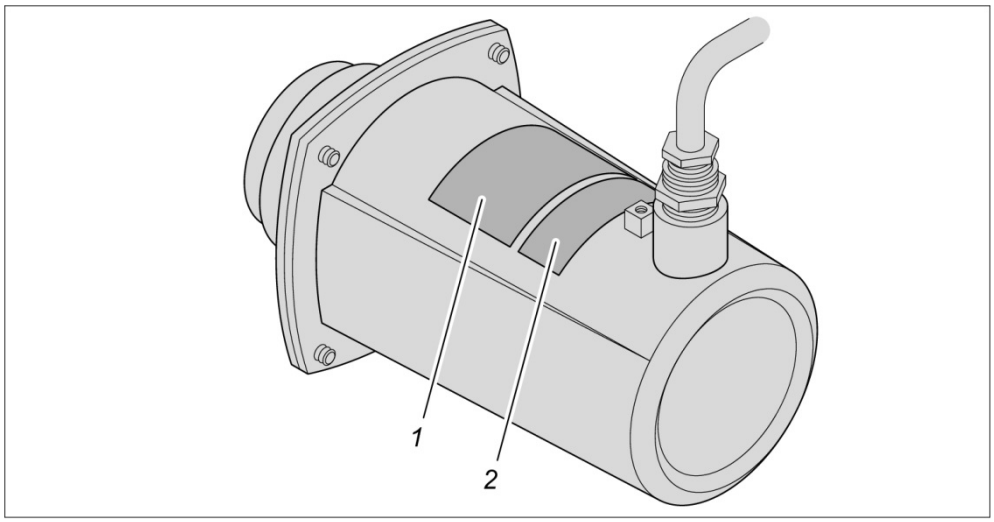
In case of contact between the laser beam and the explosive gas or dust mixture: Note the atmospheric conditions (see below).

Atmospheric conditions for the explosive gas or dust mixture

Temperature	–20 to +60 °C
Pressure (absolute)	80 to 110 kPa (0.8 to 1.1 bar)
Oxidizing agent	Air with normal oxygen content, usually 21 % (V/V)

Labels for zone 1

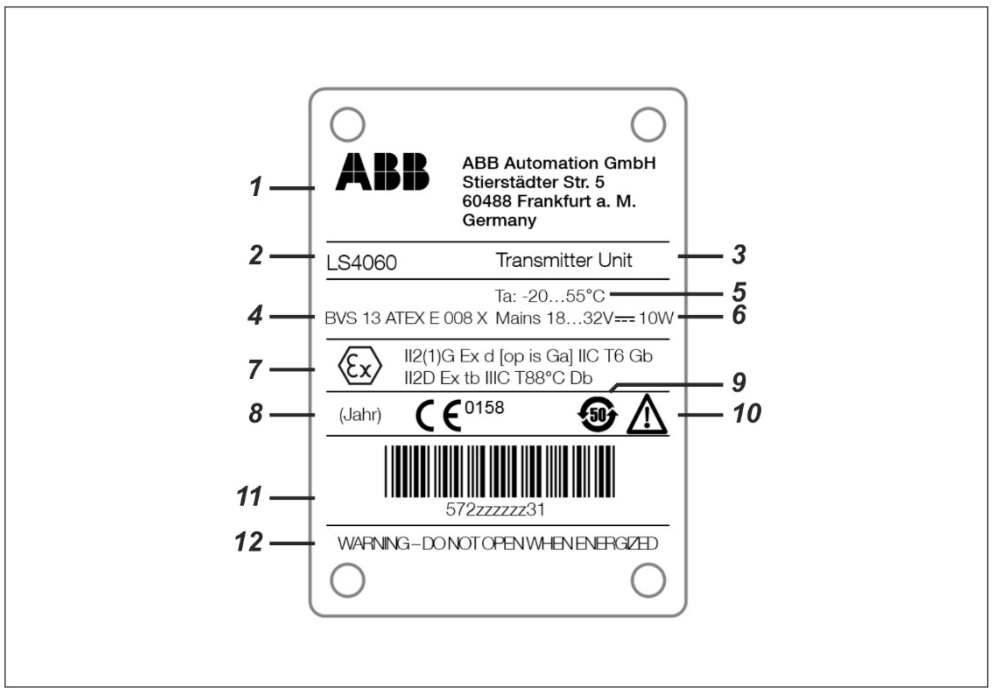
Transmitter unit and receiver unit: Position of labels



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
4	Number of EC type examination certificate
5	Permissible ambient temperature for operation
6	Supply voltage and power consumption
7	Labeling in accordance with EC type examination certificate
8	CE marking with year of manufacture and the number of the named body for explosion protection (conformity with European safety standards)
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: Consult operating instruction
11	Serial number, displayed as a bar code and in plain text
12	Warning: Do not open housing when supply voltage is present!

Transmitter unit and receiver unit: Labeling in accordance with EC type examination certificate

Specification	Meaning
II	ATEX marking II: The device is approved for atmospheres with combustible gases or dusts
2(1)G	Equipment category 2G, laser light with category 1G
Ex d [op is Ga]	Explosion protection class: Flameproof enclosure and optical radiation Optical radiation with a very high level of protection (Ga)
IIC	Explosion group IIC
T6	Temperature class T6
Gb	Device with "high" level of protection for use in areas with a potential risk of gas explosion, in which normal operation or anticipated fault/malfunction do not pose a risk of ignition

Specification	Meaning
II	ATEX marking II: The device is approved for atmospheres with combustible gases or dusts
2D	Equipment category 2D
Ex tb	Type of protection from ignition: "enclosure"
IIIC	Explosion group IIIC
T88°C	Maximum surface temperature
Db	Device with "high" level of protection for use in combustible dust atmospheres, in which normal operation or anticipated fault/malfunction do not pose a risk of ignition

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

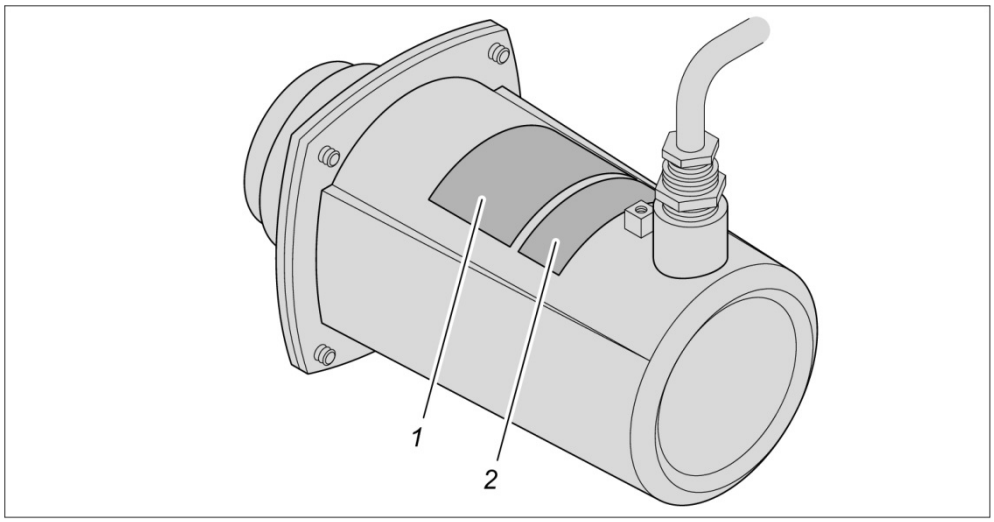
Name plate on the junction box with a built-in power supply:

Name plate on the junction box without built-in power supply:

No.	Meaning
1	Details of the manufacturer
2	Item number
3	Description of the junction box
4	Country of manufacture

Labels for zone 2

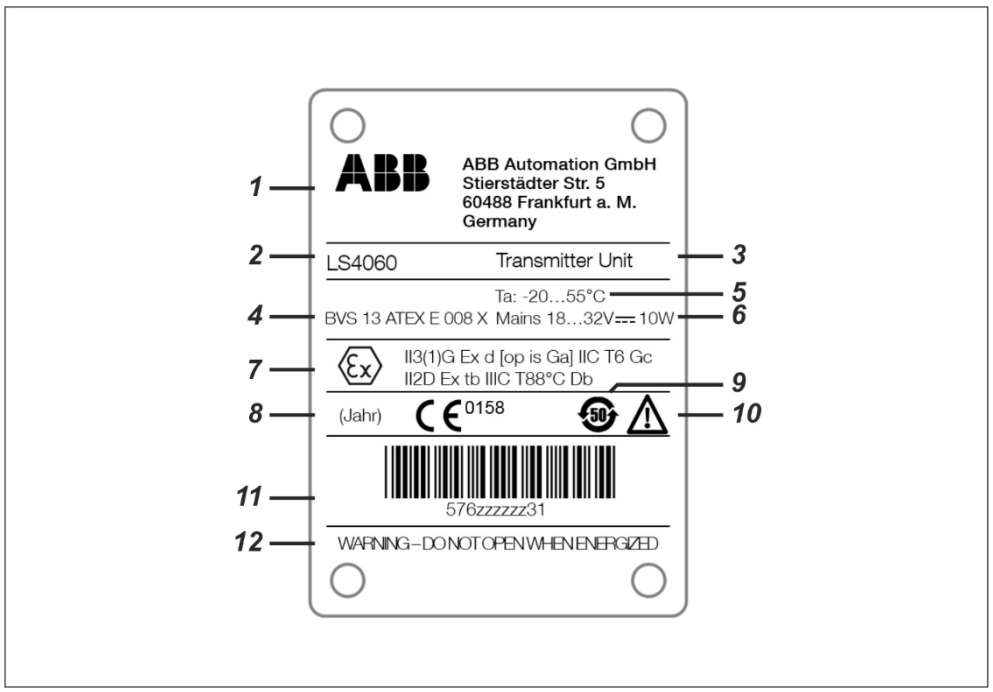
Transmitter unit and receiver unit: Position of labels



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
4	Number of EC type examination certificate
5	Permissible ambient temperature for operation
6	Supply voltage and power consumption
7	Labeling in accordance with EC type examination certificate
8	CE marking with year of manufacture and the number of the named body for explosion protection (conformity with European safety standards)
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: Consult operating instruction
11	Serial number, displayed as a bar code and in plain text
12	Warning: Do not open housing when supply voltage is present!

Transmitter unit and receiver unit: Labeling in accordance with manufacturer's certificate

Specification	Meaning
II	ATEX marking II: The device is approved for atmospheres with combustible gases or dusts
3(1)G	Equipment category 3G, laser light with category 1G
Ex d [op is Ga]	Explosion protection class: Flameproof enclosure and optical radiation Optical radiation with a very high level of protection (Ga)
IIC	Explosion group IIC
T6	Temperature class T6
Gc	Device with "extended" level of protection for use in potentially explosive atmospheres, in which during normal operation there is no risk of combustion, and which have some additional protective measures to ensure that typically foreseeable faults of the device do not pose a danger

Specification	Meaning
II	ATEX marking II: The device is approved for atmospheres with combustible gases or dusts
2D	Equipment category 2D
Ex tb	Type of protection from ignition: "enclosure"
IIIC	Explosion group IIIC
T88°C	Maximum surface temperature
Db	Device with "high" level of protection for use in combustible dust atmospheres, in which normal operation or anticipated fault/malfunction do not pose a risk of ignition

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

Name plate on the junction box with a built-in power supply:

Name plate on the junction box without built-in power supply:

No.	Meaning
1	Details of the manufacturer
2	Item number
3	Description of the junction box
4	Country of manufacture

Scope of 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.

Qty.	Description
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 (if ordered) installed, cable glands pre-installed
1	Ethernet adapter
2	Purging flanges with seals and fastening clips (as per the order)
1	CE Declaration of conformity
1	Analyzer data sheet (in the junction box)
1	Operating instruction
1	DVD-ROM "Software tools & technical documentation"
	Accessories included as per customer order

Purchasing a power supply and connection cable

If the power supply is not included with the unit: Purchase a power supply and a connection cable according to the following specifications:

Qty.	Description and specification
1	Power supply: Primary voltage: AC 100–240 V ± 10 %, mains frequency: 50 to 60 Hz, Secondary voltage: DC 24 V ± 10 %, output current: min. 400 mA, Overload protection: Power limitation
1	Secondary voltage connection cable DC 24 V to junction box: Outside diameter: min. 7 up to max. 12 mm, wire cross-section: min. 1.5 up to max. 2.5 mm^2 (AWG 16–14), cable length: max. 30 m

The power supply from a 24 V direct current mains network is not allowed.

Disposing of packaging material

Keep the transport packaging of the transmitter and receiver units for possible return. Keep the yellow protective caps of the lenses for service purposes. Dispose of the residual 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.

IECEx variant: Description

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 site	Suitable for outdoor use Operation only under atmospheric conditions according to IEC 60079-0 (limited temperature range, see below)
Ambient temperature	Operation: –20 to +55 °C, Storage: –40 to +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 to 32 V)
Total power consumption	Max. 10 W
Housing protection type	IP65
Protection class	III

Junction box (without power supply unit)

Specifications	
Dimensions (W x H x D)	300 x 230 x 111 mm
Weight	4.5 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: –20 to +55 °C

Junction box with integrated power supply

Specifications	
Dimensions (W x H x D)	230 x 461 x 165 mm
Weight	10 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: –20 to +55 °C

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100–240 V ± 10 %; 50 to 60 Hz
Power consumption	30 VA
Protection class	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 N.O. contacts 30 V/1 A DC/AC; wired in accordance with the requirements for class 2 circuits [1)]
Service port	Ethernet 10BaseT

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 EMC

Safety in accordance with European standards – CE	Tested to EN 61010-1:2010
EMC: Interference immunity	Tested to EN 61326-1:2013 Inspection level: Industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.
EMC: Emission interference	Tested to EN 61326-1:2013 Limit class B for interference field strength and interference voltages is met.

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.

If the junction box is set up outdoors, measures must be taken where necessary to ensure the intended operation. This may include rain canopies, for example, or housings offering an adequate degree of protection if necessary.

Safety rating

Preliminary remarks

⚠ **The specified explosion protection is only guaranteed when used for its intended purpose.**

Transmitter unit and receiver unit: Explosion protection

The transmitter unit and receiver unit are certified for use in explosive atmospheres as follows:

Classification	Environment	IECEx certificate
Ex d [op is] IIC T4 Gb	Environment with explosive gases	IECEx BVS 13.0013X
Ex tb IIIC T88°C Db	Environment with explosive dusts	IECEx BVS 13.0013X

The measurement function for the explosion protection is not subject to the IECEx certificate.

Junction box: Safety rating

The junction box is certified for use in potentially explosive environments as follows:

Classification	Environment	IECEx certificate
Ex e IIC T6 Gb Ex de IIC T6 Gb	Environment with explosive gases	IECEx PTB 11.0033X IECEx DEK 13.0075
Ex tb IIIC T80°C Db Ex tb IIIC T80°C Db	Environment with explosive dusts	IECEx PTB 11.0033X IECEx DEK 13.0075

For binding specifications, see name plate and manufacturer's IECEx certificate.

Laser classification

Laser classification

The laser beam comes into contact with the gas being analyzed.

The gas analyzer may be used for analysis of one of the following media:

Medium	Zone	Classification
Explosive gases	Zone 1	IIC T4
Explosive dusts	Zone 21	IIIC T88°C

⚠ **The laser analyzer is not approved for the analysis of media that contain a mixture of explosive gases and dusts.**

In case of contact between the laser beam and the explosive gas or dust mixture: Note the atmospheric conditions (see below).

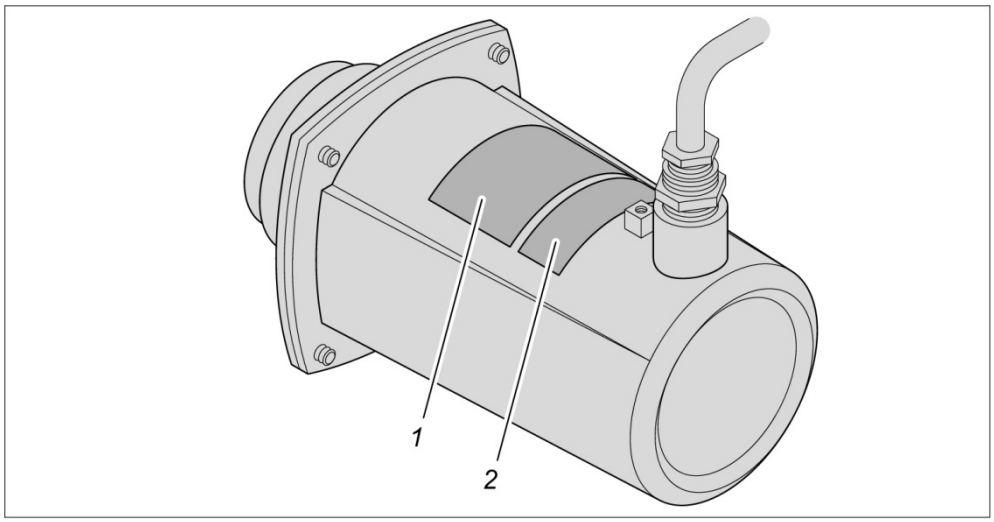
The permissible environmental conditions for the transmitter unit and receiver unit may differ from those of the junction box with respect to measuring explosive dusts, based on the different temperature classifications. Please note the relevant certification of the junction box.

Atmospheric conditions for the explosive gas or dust mixture

Temperature	−20 to +60 °C
Pressure (absolute)	80 to 110 kPa (0.8 to 1.1 bar)
Oxidizing agent	Air with normal oxygen content, usually 21 % (V/V)

Labels

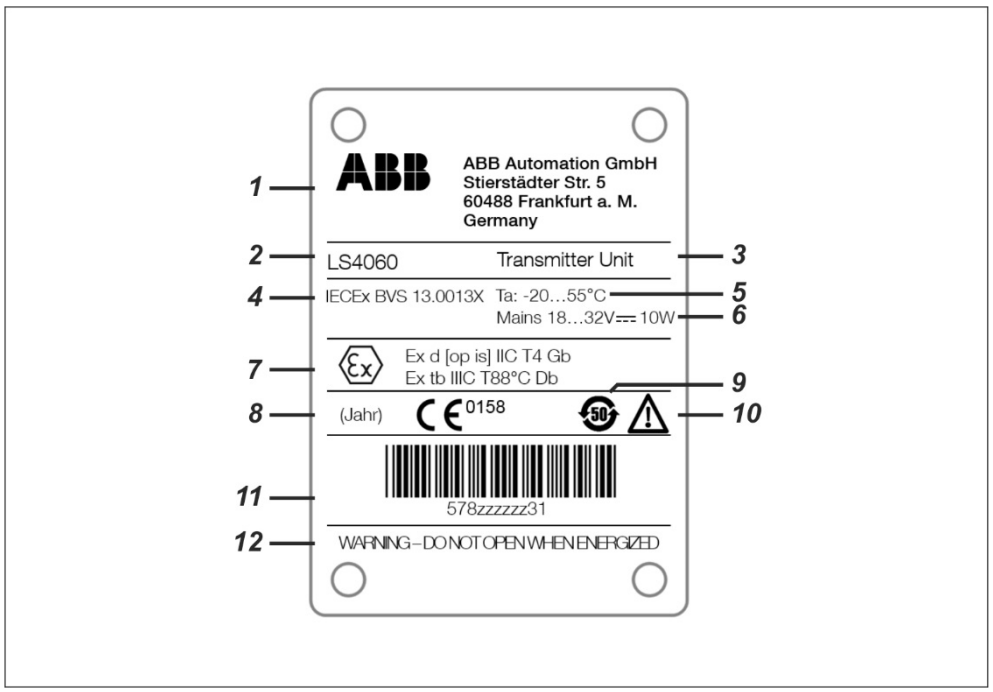
Transmitter unit and receiver unit: Position of labels



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
4	Number of the IECEx certificate
5	Permissible ambient temperature for operation
6	Supply voltage and power consumption
7	Labeling in accordance with IECEx certificate
8	CE marking with year of manufacture and the number of the named body for explosion protection (conformity with European safety standards)
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: Consult operating instruction
11	Serial number, displayed as a bar code and in plain text
12	Warning: Do not open housing when supply voltage is present!

Transmitter unit and receiver unit: Labeling in accordance with IECEx certificate

Specification	Meaning
Ex d [op is]	Explosion protection class: Flameproof enclosure and optical radiation
IIC	Explosion group IIC
T4	Temperature class T4
Gb	Device with "high" level of protection for use in areas with a potential risk of gas explosion, in which normal operation or anticipated fault/malfunction do not pose a risk of ignition

Specification	Meaning
Ex tb	Type of protection from ignition: "enclosure"
IIIC	Explosion group IIIC
T88°C	Maximum surface temperature
Db	Device with "high" level of protection for use in combustible dust atmospheres, in which normal operation or anticipated fault/malfunction do not pose a risk of ignition

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

Name plate on the junction box with a built-in power supply:

Name plate on the junction box without built-in power supply:

No.	Meaning
1	Details of the manufacturer
2	Item number
3	Description of the junction box
4	Country of manufacture

Scope of 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.

Qty.	Description
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 (if ordered) installed, 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 & technical documentation"
	Accessories included as per customer order

Purchasing a power supply and connection cable

If the power supply is not included with the unit: Purchase a power supply and a connection cable according to the following specifications:

Qty.	Description and specification
1	Power supply: Primary voltage: AC 100–240 V ± 10 %, mains frequency: 50 to 60 Hz, Secondary voltage: DC 24 V ± 10 %, output current: min. 400 mA, Overload protection: power limitation
1	Secondary voltage connection cable DC 24 V to junction box: Outside diameter: min. 7 up to max. 12 mm, wire cross-section: min. 1.5 up to max. 2.5 mm^2 (AWG 16–14), cable length: max. 30 m

The power supply from a 24 V direct current mains network is not allowed.

Disposing of packaging material

Keep the transport packaging of the transmitter and receiver units for possible return. Keep the yellow protective caps of the lenses for service purposes. Dispose of the residual 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.

KCs variant: Description

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 site	Suitable for outdoor use Operation only under atmospheric conditions according to IEC 60079-0 (limited temperature range, see below)
Ambient temperature	Operation: –20 to +55 °C, Storage: –40 to +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 to 32 V)
Total power consumption	Max. 10 W
Housing protection type	IP65
Protection class	III

Junction box (without power supply unit)

Specifications	
Dimensions (W x H x D)	300 x 230 x 111 mm
Weight	4.5 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: –20 to +55 °C

Junction box with integrated power supply

Specifications	
Dimensions (W x H x D)	230 x 461 x 165 mm
Weight	10 kg
Housing protection type	IP65
Installation site	Suitable for outdoor use
Ambient temperature	Operation: –20 to +55 °C

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100–240 V ± 10 %; 50 to 60 Hz
Power consumption	30 VA
Protection class	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 N.O. contacts 30 V/1 A DC/AC; wired in accordance with the requirements for class 2 circuits [1)]
Service port	Ethernet 10BaseT

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 EMC

Safety in accordance with European standards – CE	Tested to EN 61010-1:2010
EMC: Interference immunity	Tested to EN 61326-1:2013 Inspection level: Industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.
EMC: Emission interference	Tested to EN 61326-1:2013 Limit class B for interference field strength and interference voltages is met.

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.

If the junction box is set up outdoors, measures must be taken where necessary to ensure the intended operation. This may include rain canopies, for example, or housings offering an adequate degree of protection if necessary.

Safety rating

Preliminary remarks

⚠ **The specified explosion protection is only guaranteed when used for its intended purpose.**

Transmitter unit and receiver unit: Explosion protection

The transmitter unit and receiver unit are certified for use in explosive atmospheres as follows:

Classification	Environment	KCs certificate
Ex d IIC T4	Environment with explosive gases	15-AV4BO-0281
Ex td A21 IP66 T88°C	Environment with explosive dusts	15-AV4BO-0282

The measurement function for the explosion protection is not subject to the KCs certificate.

Junction box: Safety rating

The junction box is certified for use in potentially explosive environments as follows:

Classification	Environment	KCs certificate
Ex e II T6	Environment with explosive gases	15-AV4BO-0115
Ex td A21 IP6X T80°C	Environment with explosive dusts	15-AV4BO-0117

For binding specifications, see name plate and manufacturer's KCs certificate.

Laser classification

Laser classification

The laser beam comes into contact with the gas being analyzed.

The gas analyzer may be used for analysis of one of the following media:

Medium	Zone	Classification
Explosive gases	Zone 1	IIC T4
Explosive dusts	Zone 21	T88°C

⚠ **The laser analyzer is not approved for the analysis of media that contain a mixture of explosive gases and dusts.**

In case of contact between the laser beam and the explosive gas or dust mixture: Note the atmospheric conditions (see below).

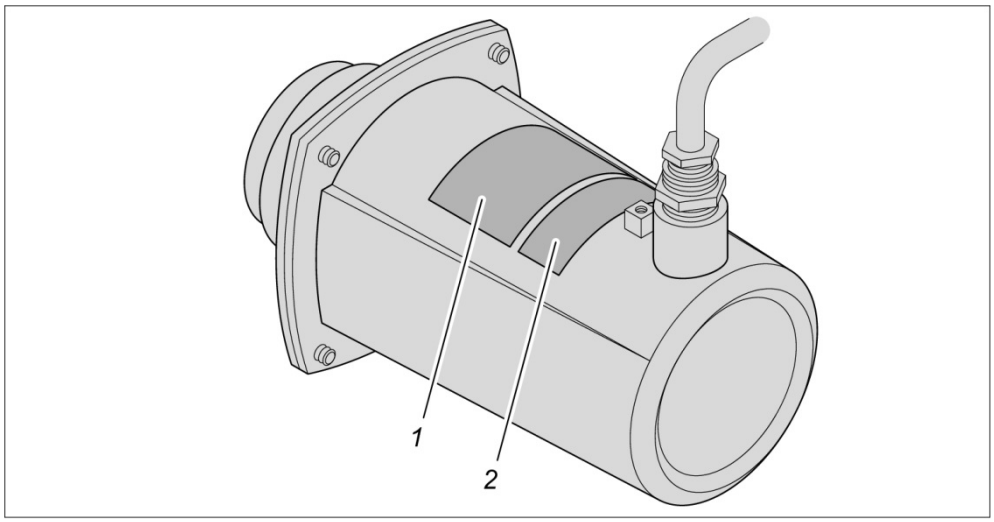
The permissible environmental conditions for the transmitter unit and receiver unit may differ from those of the junction box with respect to measuring explosive dusts, based on the different temperature classifications. Please note the relevant certification of the junction box.

Atmospheric conditions for the explosive gas or dust mixture

Temperature	–20 to +60 °C
Pressure (absolute)	80 to 110 kPa (0.8 to 1.1 bar)
Oxidizing agent	Air with normal oxygen content, usually 21 % (V/V)

Labels

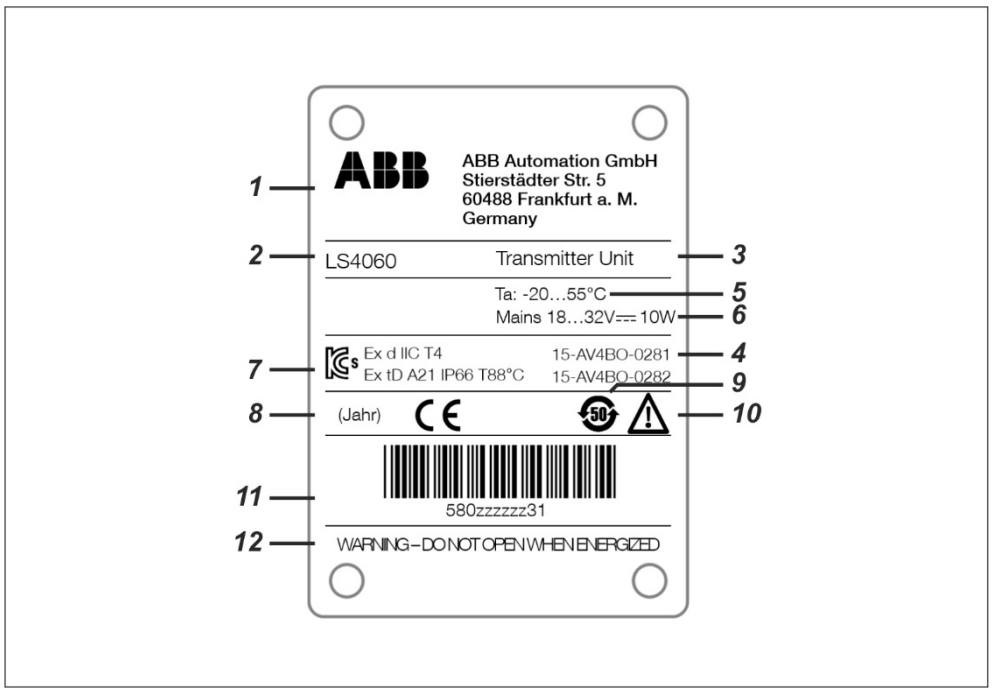
Transmitter unit and receiver unit: Position of labels



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
4	Number of the KCs certificate
5	Permissible ambient temperature for operation
6	Supply voltage and power consumption
7	Labeling in accordance with KCs certificate
8	CE marking with year of manufacture and the number of the named body for explosion protection (conformity with European safety standards)
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: Consult operating instruction
11	Serial number, displayed as a bar code and in plain text
12	Warning: Do not open housing when supply voltage is present!

Transmitter unit and receiver unit: Labeling in accordance with KCs certificate

Specification	Meaning
Ex d	Explosion protection class: Flameproof enclosure and optical radiation
IIC	Explosion group IIC
T4	Temperature class T4

Specification	Meaning
Ex tD A21	Protection by enclosures. Labeling according to practice A for zone 21 (EN 61241-1, IEC 61241-1, ISA 61241-1)
IP66	Housing degree of protection
T88°C	Maximum surface temperature

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

Name plate on the junction box without built-in power supply:

No.	Meaning
1	Details of the manufacturer
2	Item number
3	Description of the junction box
4	Country of manufacture

Scope of 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.

Qty.	Description
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 (if ordered) installed, 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 & technical documentation"
	Accessories included as per customer order

Purchasing a power supply and connection cable

Since the power supply is not included with the unit: Purchase a power supply and a connection cable according to the following specifications:

Qty.	Description and specification
1	Power supply: Primary voltage: AC 100–240 V ± 10 %, mains frequency: 50 to 60 Hz, Secondary voltage: DC 24 V ± 10 %, output current: min. 400 mA, Overload protection: power limitation
1	Secondary voltage connection cable DC 24 V to junction box: Outside diameter: min. 7 up to max. 12 mm, wire cross-section: min. 1.5 up to max. 2.5 mm^2 (AWG 16–14), cable length: max. 30 m

The power supply from a 24 V direct current mains network is not allowed.

Disposing of packaging material

Keep the transport packaging of the transmitter and receiver units for possible return. Keep the yellow protective caps of the lenses for service purposes. Dispose of the residual 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.

CSA variant: Description

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 site	Suitable for outdoor use
Ambient temperature	Operation: −20 to +55 °C, Storage: −40 to +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 to 32 V)
Total power consumption	Max. 10 W
Housing protection type	IP65
Protection class	III

Junction box

Specifications	
Dimensions (W x H x D)	365 x 235 x 275 mm
Weight	28 kg
Housing protection type	Type 3, 4X, 7 & 9
Installation site	Suitable for outdoor use
Ambient temperature	Operation: −25 to +50 °C

Power supply (in the junction box)

Specifications	
Operating voltage	AC 100–240 V ± 10 %; 50 to 60 Hz
Power consumption	30 VA
Protection class	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
Primary fuses (2 x)	AC 600 V, 4 A, slow blow Siemens model 3NW1 040-0HG
Secondary fuse (1 x)	AC 600 V, 0.8 A, slow blow Siemens model 3NW1 008-0HG

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 N.O. contacts 30 V/1 A DC/AC; wired in accordance with the requirements for class 2 circuits [1)]
Service port	Ethernet 10BaseT

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 EMC

Safety in accordance with European standards – CE	Tested to EN 61010-1:2010
Safety in accordance with U.S. and Canadian standards – UL, CSA	The LS4000 and LS4060 gas analyzers are certified for use in "General Purpose" environments. They comply with the standards CAN/CSA-C22.2 No. 61010-1-12 and UL Std. No. 61010-1 (3rd Edition).
EMC: Interference immunity	Tested to EN 61326-1:2013 Inspection level: Industrial area, fulfills at least the evaluation criteria according to Table 2 of EN 61326-1.
EMC: Emission interference	Tested to EN 61326-1:2013 Limit class B for interference field strength and interference voltages is met.

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.

Safety rating

Preliminary remarks

⚠ **The specified explosion protection is only guaranteed when used for its intended purpose.**

Transmitter unit and receiver unit: Explosion protection

The transmitter unit and receiver unit are certified for use in explosive atmospheres as follows:

Classification	Environment	CSA certificate
Class I, Div. 1, Groups B, C, D; Class I, Div. 2, Groups A, B, C, D; T4A	Environment with explosive gases	12.2589676X
Class I, Zone 1, AEx d, IIB+H2 T4	Environment with explosive gases	12.2589676X

Junction box: Safety rating

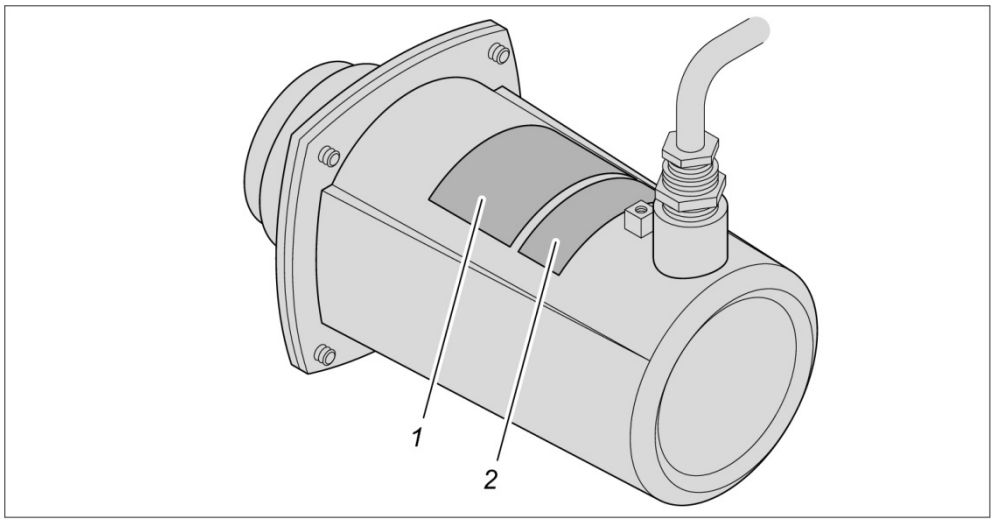
The junction box is certified for use in potentially explosive environments as follows:

Classification	Environment
Class I, Div. 1, Groups B, C, D Class I, Zone 1, Group IIB + H2	Environment with explosive gases

For binding specifications, see name plate and manufacturer's certificate.

Labels

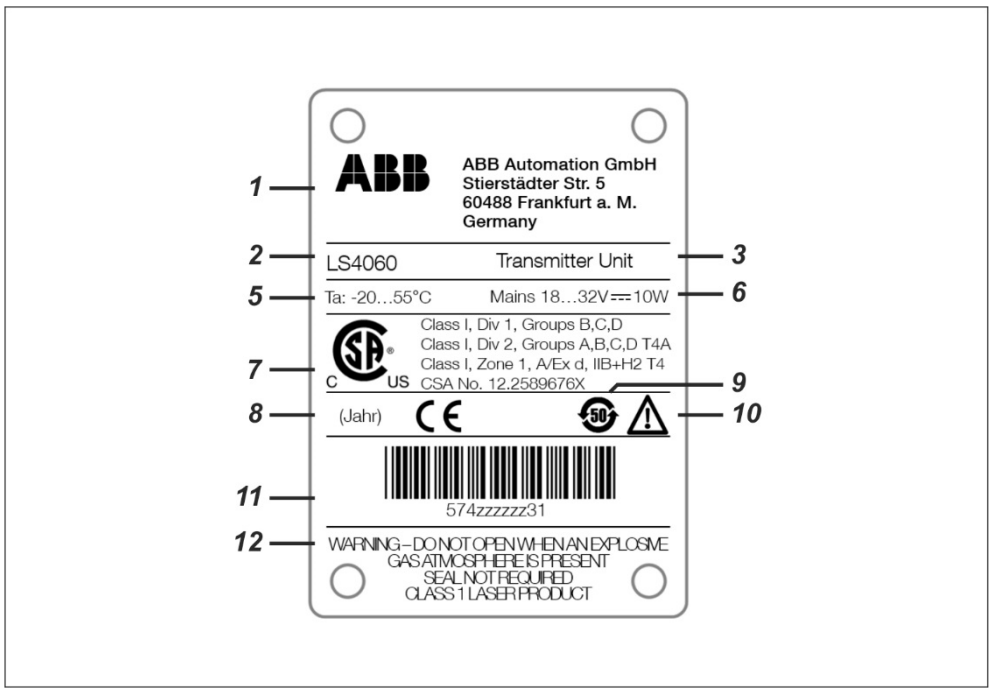
Transmitter unit and receiver unit: Position of labels



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
6	Supply voltage and power consumption
7	Labeling in accordance with CSA certificate
8	CE marking with year of manufacture
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: Consult operating instruction
11	Serial number, displayed as a bar code and in plain text
12	Warning: Do not open housing in explosive gas atmospheres Note: Housing seal not required Note: Class 1 laser product

Transmitter unit and receiver unit: Labeling in accordance with CSA certificate

Specification	Meaning
Class I	Approval for atmospheres with flammable gases
Div 1, Div 2	Approval for division 1 and division 2 potentially explosive atmospheres
Zone 1	Approval for zone 1 potentially explosive atmospheres
A/Ex d	Type of protection: Flameproof enclosure
Groups B, C, D	Approval for potentially explosive atmospheres with a mixture of all flammable gases except acetylene (C_2H_2)
Groups A, B, C, D	Approval for potentially explosive atmospheres with a mixture of all flammable gases
T4, T4A	Temperature class T4/T4A
IIB+H2	Approval for potentially explosive atmospheres with a mixture of all flammable gases except acetylene (C_2H_2)
CSA no.	Number of the CSA certificate

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: Deciphering the name plate

No.	Meaning
1	Details of the manufacturer
2	Item number
3	Description of the junction box
4	Country of manufacture

Scope of 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.

Qty.	Description
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, built-in power supply
2	Cable glands for connecting the connection cables for the transmitter unit and receiver unit to the junction box with installation manual
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 & technical documentation"
	Accessories included as per customer order

Disposing of packaging material

Keep the transport packaging of the transmitter and receiver units for possible return. Keep the yellow protective caps of the lenses for service purposes. Dispose of the residual 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.

Preparing for installation

Explosion protection

Checking the explosion protection

Use the name plates to check whether the following components have the necessary explosion protection for the site:

- Transmitter unit
- Receiver unit
- Junction box

If ...	then ...
all components have the necessary explosion protection	all components can be installed.
at least one of the components does not have the required explosion protection	the component in question must not be installed.

Measuring of flammable and explosive gas mixtures

The General Purpose variant may be used for measuring a flammable gas mixture, i.e. the laser beam may pass through a flammable gas mixture, if the following conditions are met:

- The laser beam must never pass through an explosive gas mixture.
- The gas analyzer must be de-energized when an explosive gas mixture is present.

When the laser beam shall pass through an explosive gas mixture, an explosion-proof variant of the gas analyzer with type test certificate must be used.

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	Ensure that any remaining explosive gases or dust have been completely removed.
5	Ensure that no more explosive gases or dust can be produced.
6	Secure the system against startup.

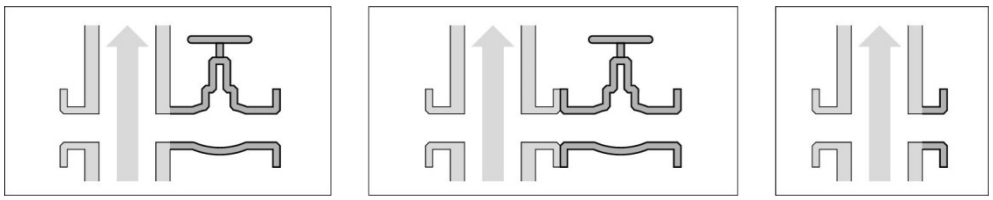
Preparing the installation site

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.

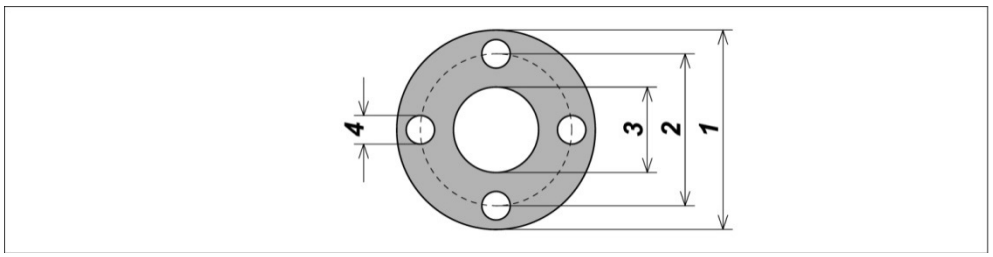
The installation flanges at the installation site can be designed as follows:

- 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.



Installation flange dimensions

Ensure that the installation flanges have the correct dimensions.

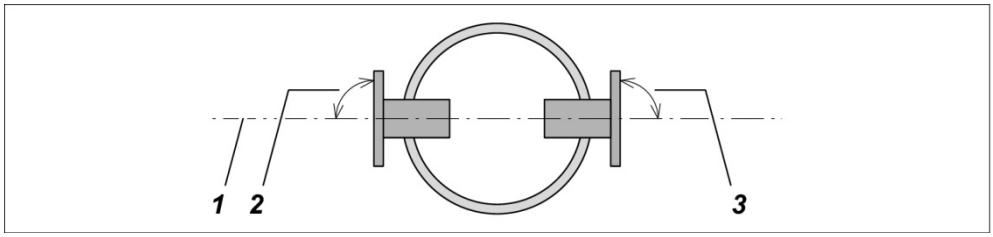


Installation flange dimensions for DN 50/PN 10-40 DIN EN 1092-1 type A (DIN 2526 type B) – Flat (turned) facing			
No.	**Meaning**	**Dimension**	**Tolerance**
1	Outer diameter	165 mm	Max. ± 0.5 mm
2	Pitch circle diameter	125 mm	Max. ± 0.3 mm
3	Internal diameter	49.7 to 65.3 mm	
4	Hole diameter	18 mm	Max. ± 0.2 mm

Installation flange dimensions for ANSI 2 in./150 lbs. 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 to 65.3 mm	
4	Hole diameter	19 mm	Max. ± 0.2 mm

Parallel installation flanges

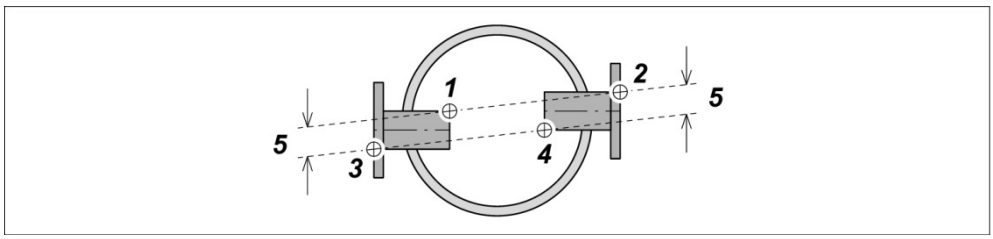
Ensure that the installation flanges are as parallel to one another as possible.



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 tolerance range	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
- Nitrogen

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.

Laying out tools, installation materials and support materials

Laying out tools

Lay out the following tools:

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

Laying out support materials

Lay out the following support materials:

Qty.	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
- If there is a danger of explosion due to dust, precautionary measures must be taken to prevent the development of static charges on the surface of cables and leads.

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 on page 79.

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

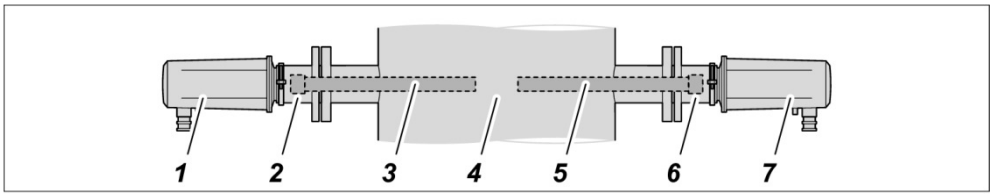
Providing an overview

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

Ensuring safety

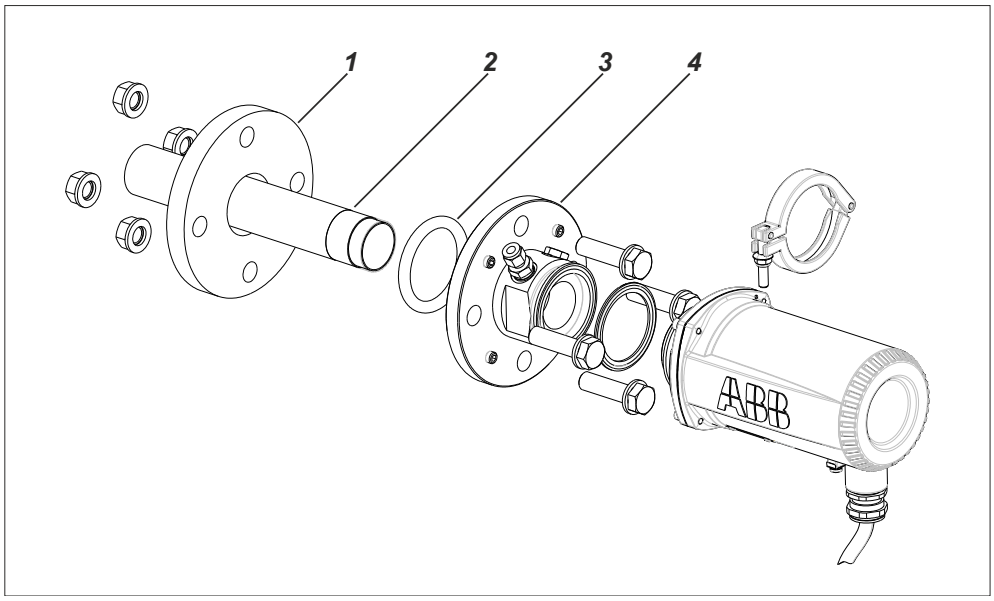
No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

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 purging flange ***4*** on installation flange ***1*** (see page 67).

Option: Installing the isolation flanges

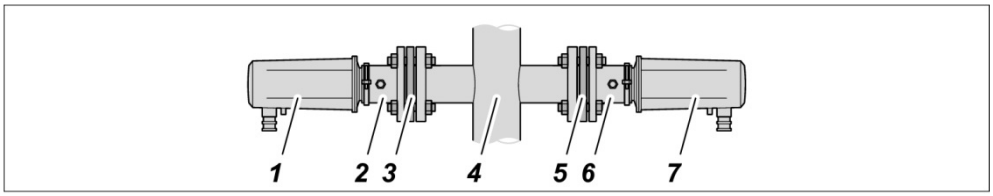
Providing an overview

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 flanges 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 must not 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 is not certified in accordance with the European Directive 97/23/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® SSTC^{TA-L} from Frenzelit Werke GmbH).

Installing the isolation flanges

Ensuring safety

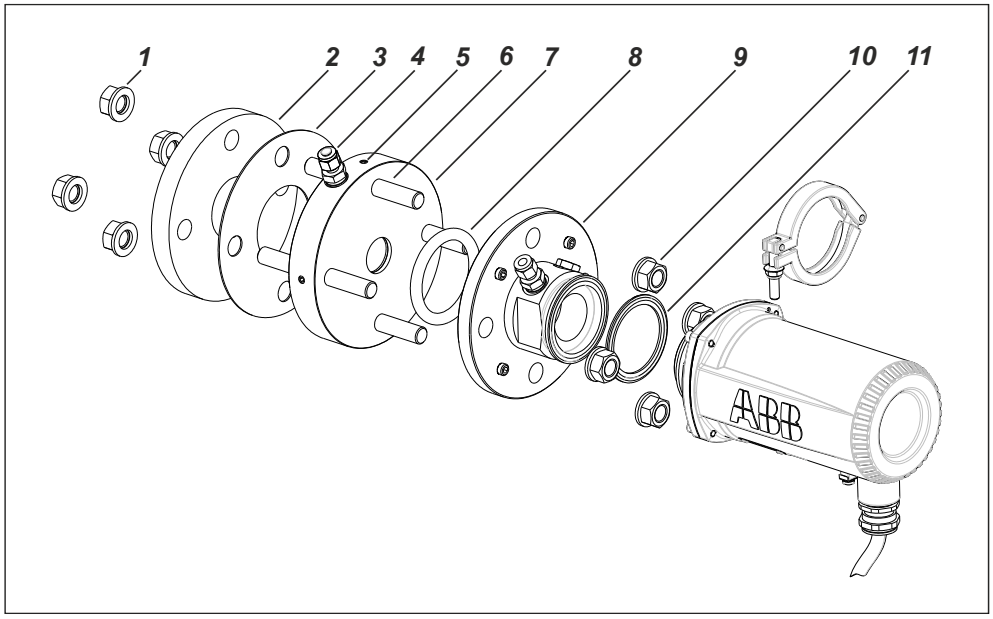
No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

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 (¼ 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 flange 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 ***5***.
2	Insert the isolation flange flat gasket ***3*** between the installation flange ***2*** and the isolation flange ***7***.
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. Otherwise, the window is not purged.
4	Insert the isolation 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*** (¼ inch Swagelok® connection).

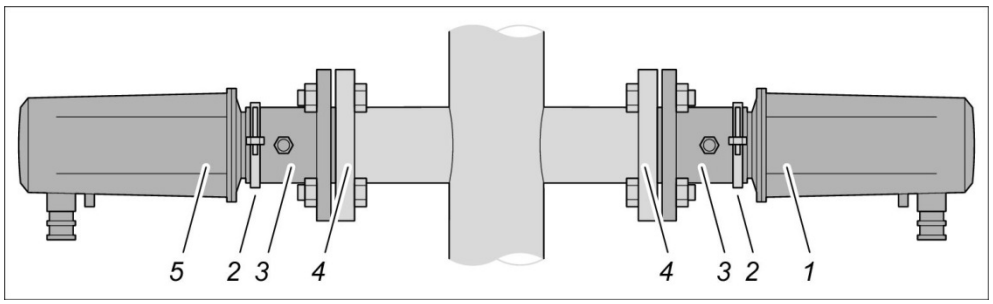
Tightening fastening nuts

ⓘ 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 ¼ inch Swagelok® connection for pipes with an 8 mm outside diameter.

Installing the purging flanges

Ensuring safety

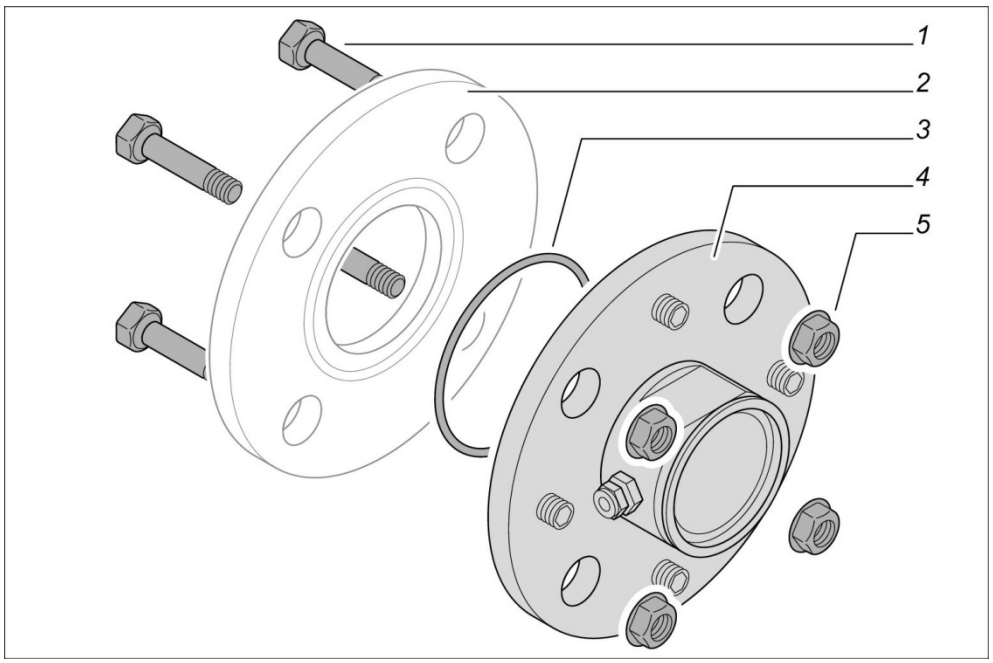
No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Fitting the purging flanges to the installation flanges

The installation steps are the same for both purging flanges.



No.	Meaning
1	4x M16 bolts
2	Installation flange
3	Purging flange O-ring
4	Purging flange
5	4x M16 nuts

Install the purging flanges as follows:

Step	Procedure
1	Insert the 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

The laser alignment tool must be used for the rough coaxial alignment of the opposite purging flange. 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.

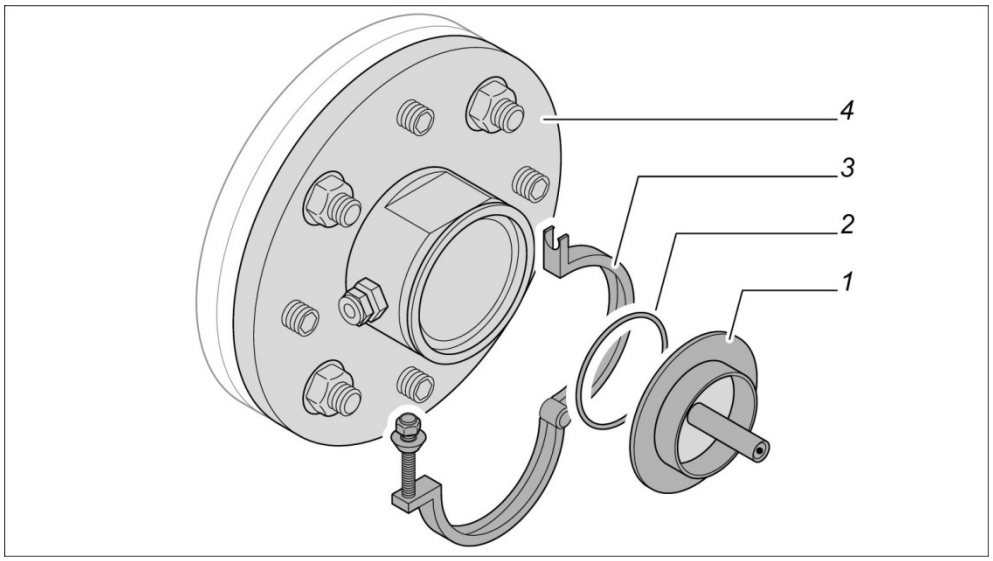
The clamps for fastening the laser alignment tool must only be used to fasten the laser pointer and the focusing screen. It is prohibited to use these clamps for mounting the transmitter unit and the receiver unit. The clamps are labeled with a corresponding note.

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

Rough pre-alignment: Three-step procedure

Step	Procedure
1	Install the laser pointer on the purging flange to which the transmitter unit is to be fitted and the focusing screen on the purging flange to which the receiver unit is to be fitted. Perform the rough pre-alignment.
2	Install the laser pointer on the purging flange to which the receiver unit is to be fitted and the focusing screen on the purging flange to which the transmitter unit is to be fitted. Perform the rough pre-alignment.
3	Install the laser pointer on the purging flange to which the transmitter unit is to be fitted and the focusing screen on the purging flange to which the receiver unit is to be fitted. Perform the rough pre-alignment.

Installing the laser pointer

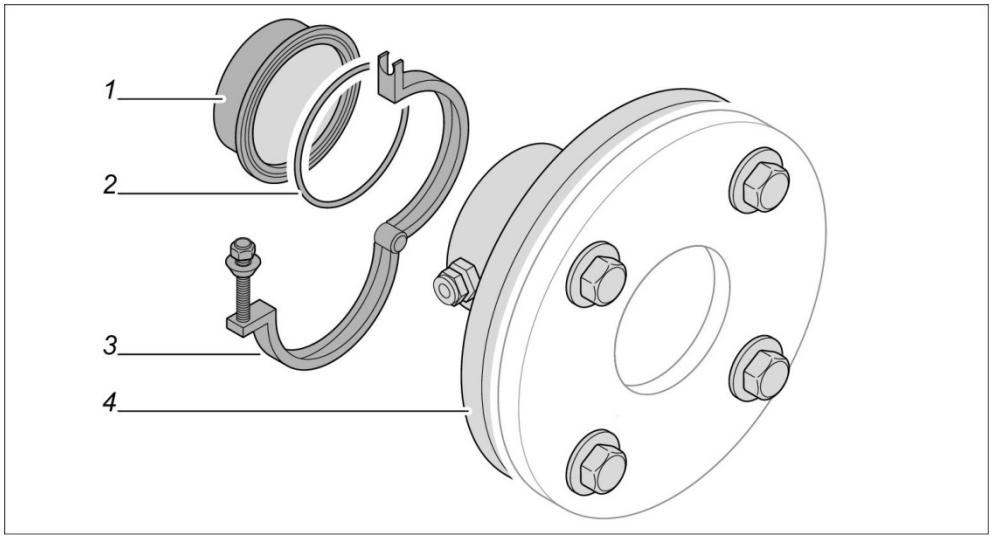


No.	Meaning
1	Laser pointer
2	Purging flange flat gasket
3	Clamp
4	Purging flange

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



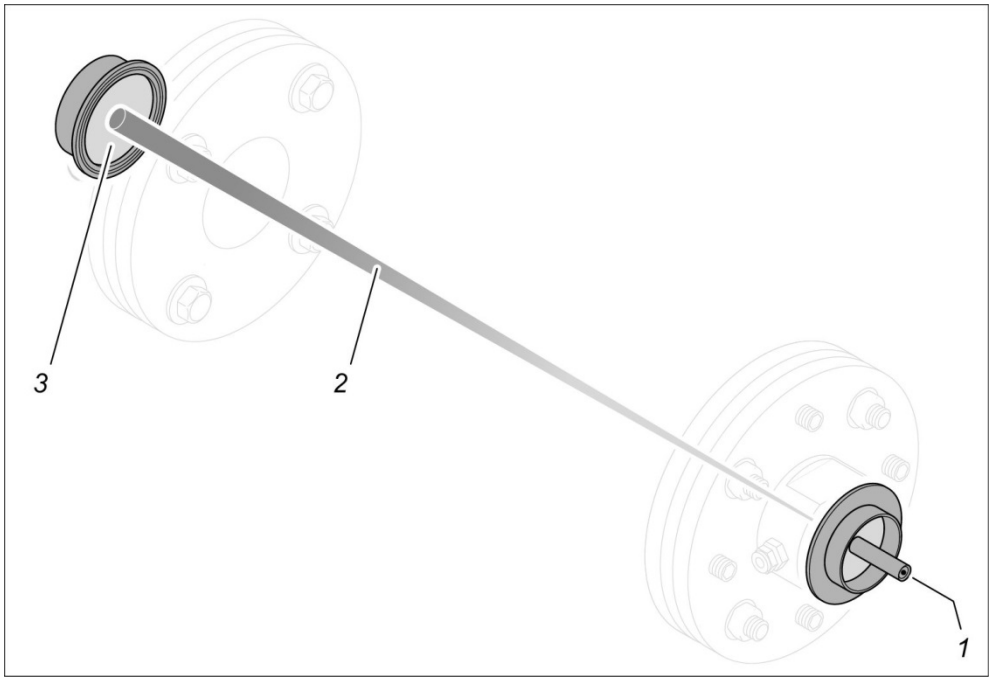
No.	Meaning
1	Focusing screen
2	Purging flange flat gasket
3	Clamp
4	Purging flange

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***.

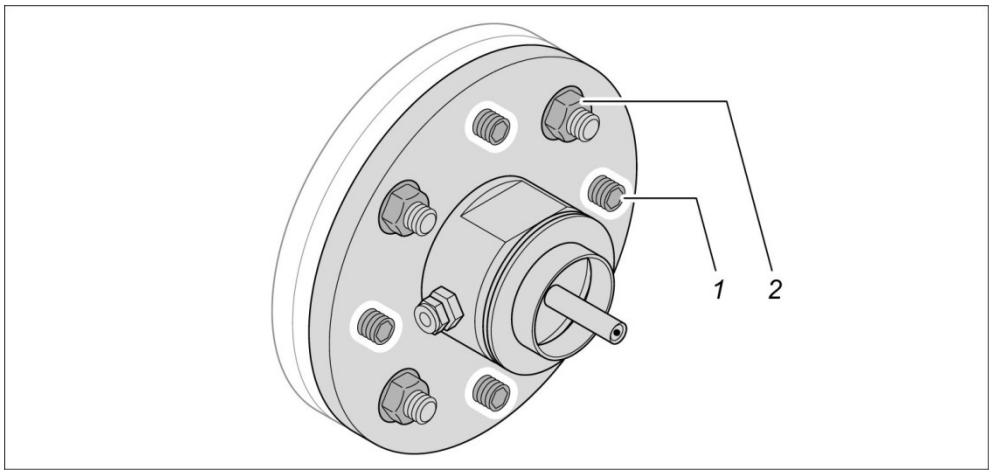
Principle of rough pre-alignment

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



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

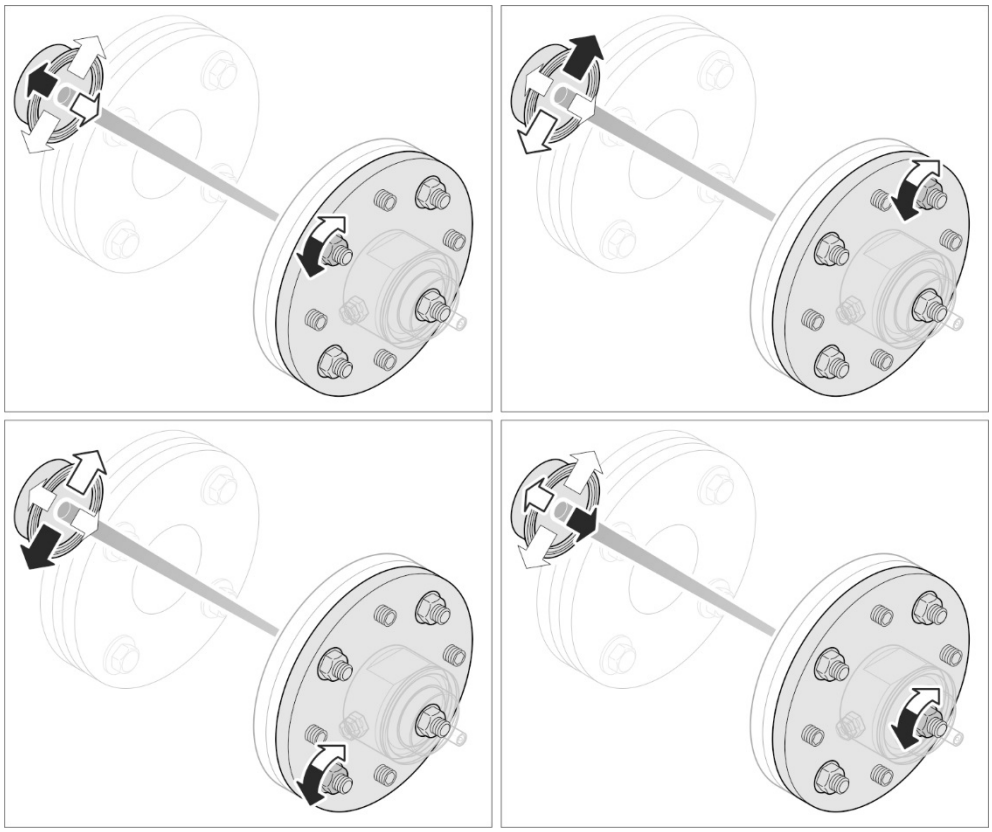
Roughly pre-aligning the purging flanges



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 flange 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 (¼ inch Swagelok® connection).

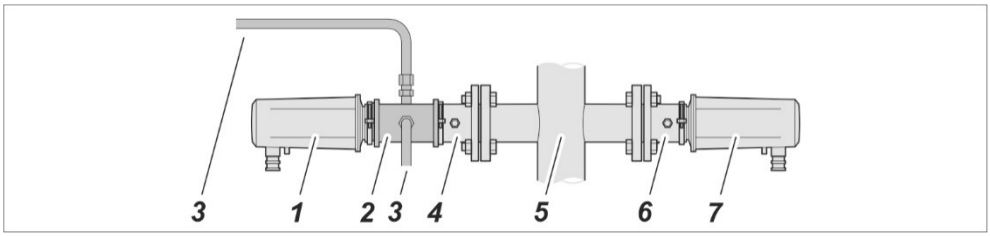
Option: Installing the validation cell

Providing an overview

Under what circumstances is a validation cell required?

If ...	then ...
the process must be validated 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 purging flanges have a ¼ 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

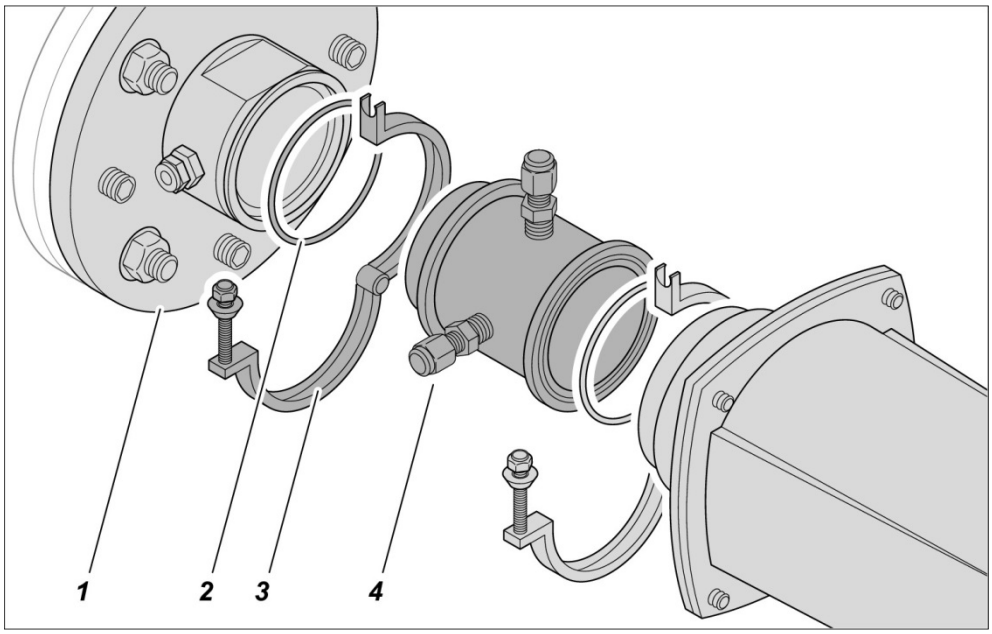
Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Installing the validation cell



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

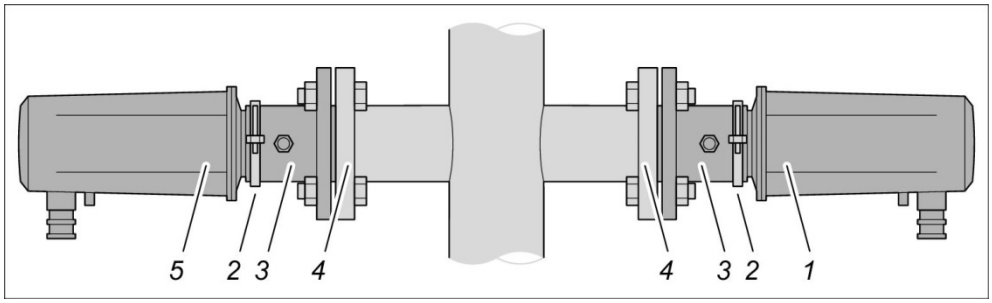
Install the validation cell as follows:

Step	Procedure
1	Place the purging flange flat gasket ***2*** into the groove of the purging flange ***1***.
2	Place the validation cell ***4*** onto 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 ¼ 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

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

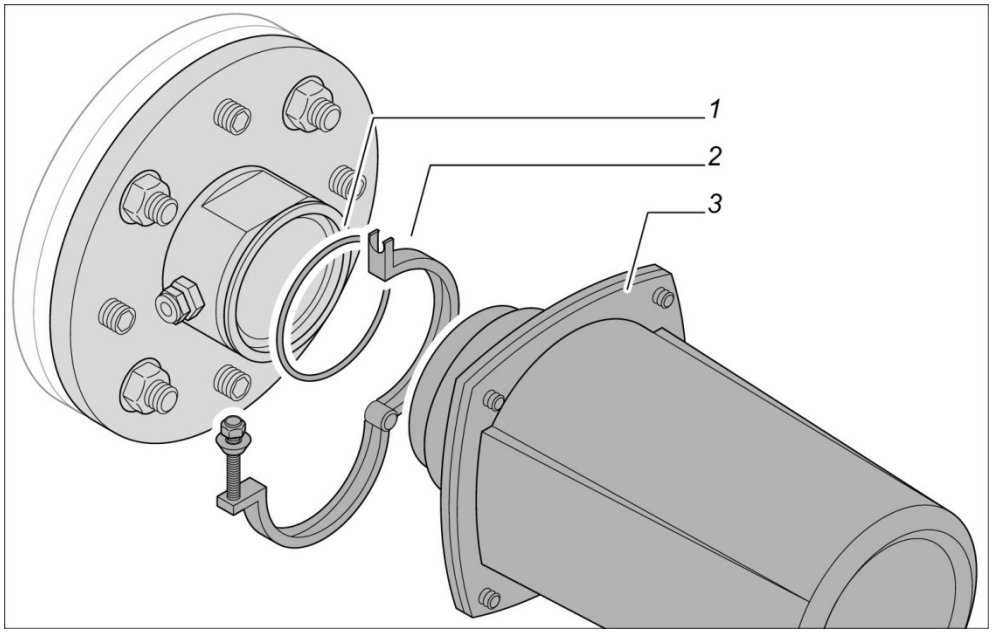
Make sure that no explosive gases or dusts are present when performing this work.

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 and the receiver unit onto the purging flange.
4	Attach the transmitter unit and the receiver unit using the clamp ***2***.

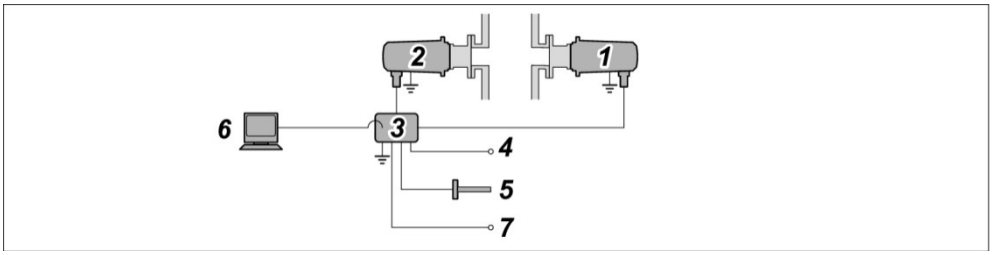
Purging after installation

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.

General Purpose variant: Electrical connections

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 to 14 mm

Connection cables for T/P probes

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

Connection cables for the power supply

Outer diameter	Min. 7 mm up to max. 12 mm Suitable for cable gland M20
Wire cross-section	3 x min. 1.5 mm^2 to max. 2.5 mm^2 (AWG 16–14) Laying of single wires is only permitted 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
Version	Fitting with integrated cable seal and option to connect a conduit
Conduit outside diameter	19 mm

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

Cable cross-section	Max. 4 mm^2; typ. 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 isolator 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.

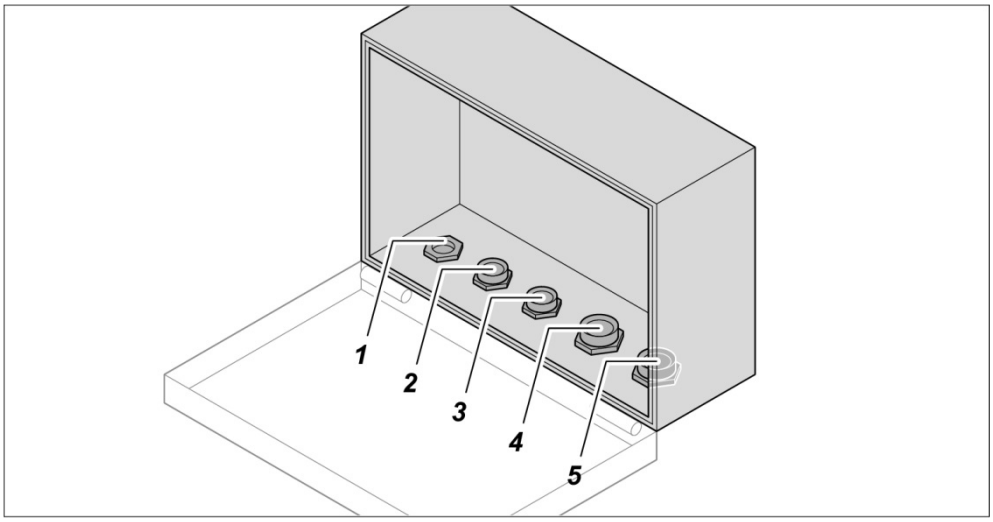
Selecting a suitable cable gland

Selecting a suitable cable gland

Select a suitable cable gland for each cable.

The following always applies:

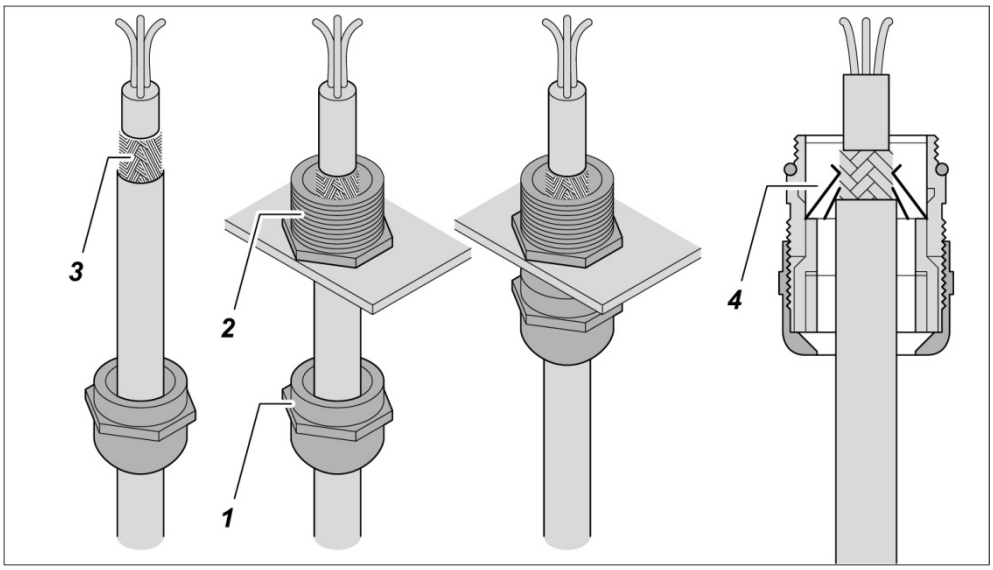
- Shielded cables must only be routed through metal cable glands.
- The cable diameter must fit the diameter of the cable gland.



No.	Cables	Cable gland	Diameter
1	Power supply	M20	8–15 mm
2	T/P 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 torques: M20 power supply: 10 Nm M20 T/P probes and analog/digital outputs: 12 Nm M25 connecting cable transmitter/receiver unit: 12 Nm
3	Close the junction box. Ensure that all of the unused cable glands are tightly sealed.

Connecting the electrical leads

Establishing a protective grounding

Establishing a protective grounding

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

Proceed as follows:

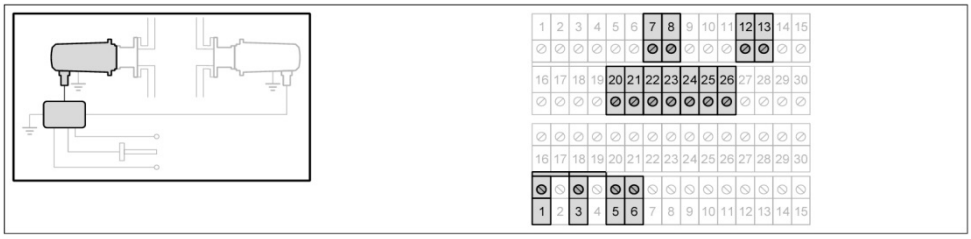
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

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–

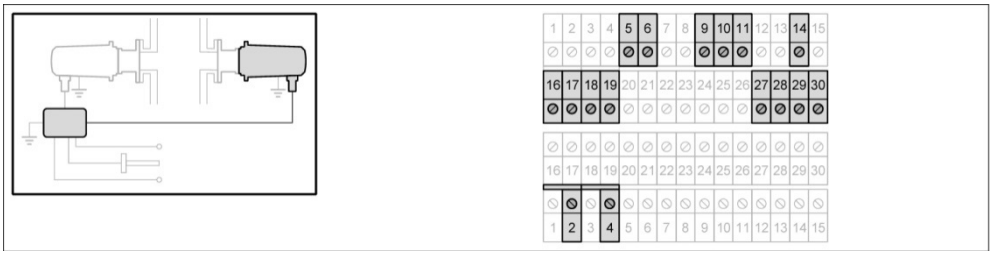
1) This wire is not used and must be secured in the junction box. If a power supply is installed in the junction box, the wire that is not used can be connected to a free PE terminal. Otherwise, the wire must be insulated with heat shrink tubing and fixed to the cable harness with cable ties.

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
14	Blue	AO3 (4–20 mA)
11	Red	AUX_IO
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

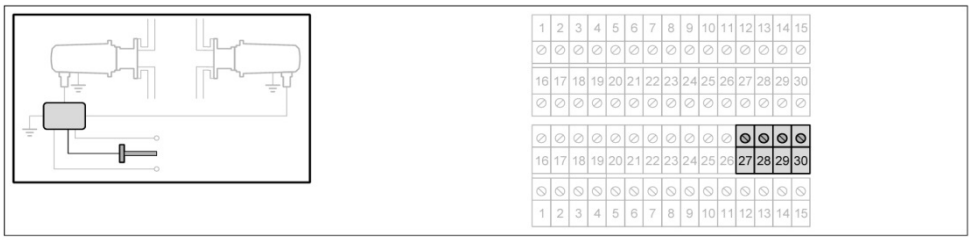
Option: Connecting the T/P probes to the junction box

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.



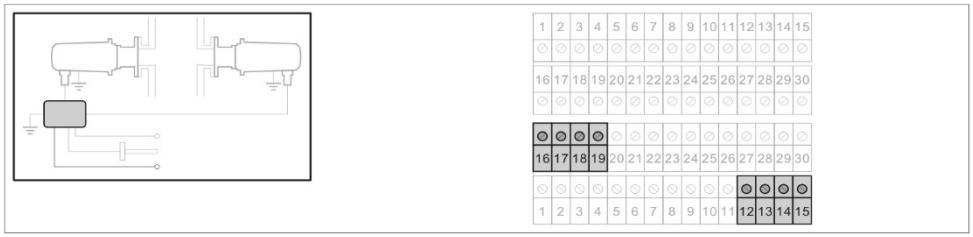
Connections to the terminal strip are made as follows:

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 (4–20 mA)	Analog output 1
13	AO2 (4–20 mA)	Analog output 2
14	AO3 (4–20 mA)	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 (see page 173).

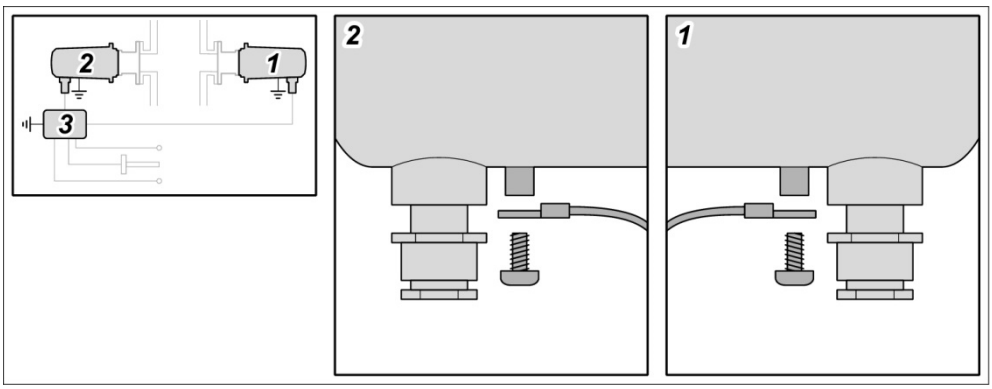
Connecting the potential equalization terminal

Connecting the potential equalization terminal

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!

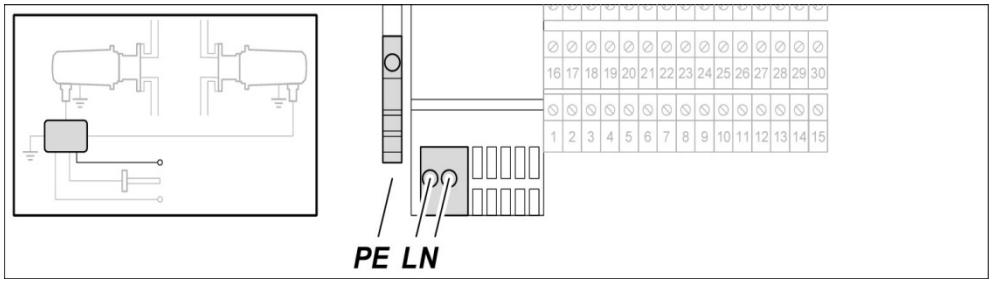
Note the cable specification

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 AC 100–240 V power supply



Connections to the power supply unit are made as follows:

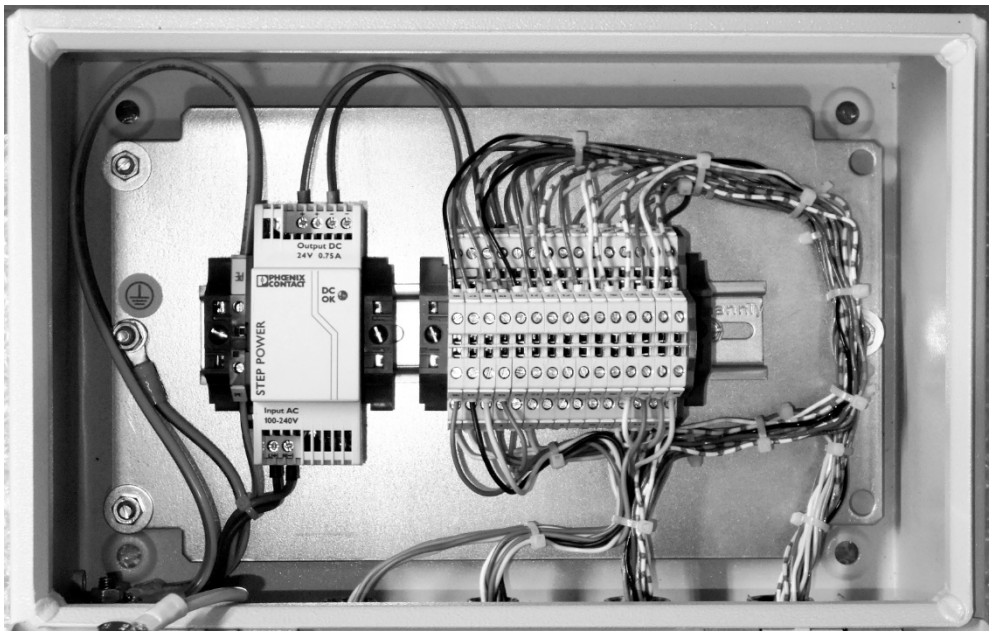
Terminal	Cable wire color	Component	Function
PE	Green/yellow	PE terminal strip	Protective earth
L	Brown	Power supply unit	AC 100–240 V (phase)
N	Blue	Power supply unit	AC 100–240 V (neutral)

Tightening torque of the screw terminals: 0.5–0.6 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

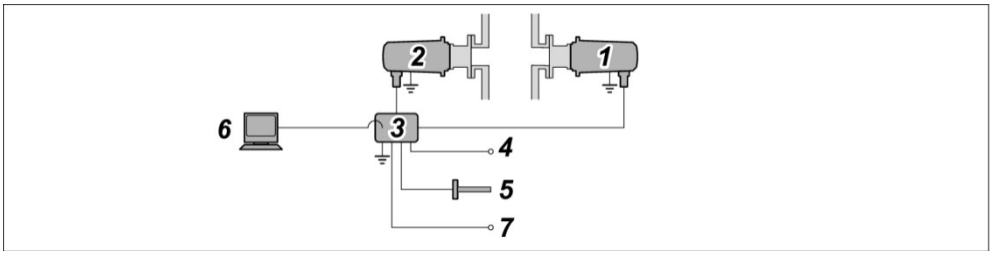
Within the junction box, as shown in the figure, the primary lines and the secondary lines must be laid at a distance and secured with cable ties in such a way that contact between them is excluded.



ATEX variant: Electrical connections

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

⚠ **The ABB declarations regarding explosion protection relate to the transmitter unit and the receiver unit. The current declarations and safety instructions of the relevant manufacturer must be observed with regard to the junction box and its installation.**

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.

Please note:

- The connection cables must only be replaced with genuine replacement cables.
- The connection cables may be shortened to a remaining minimum length of 1.00 m.

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

Connection cables for T/P probes

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

Connection cables for the power supply

Outer diameter	Min. 7 mm up to max. 12 mm Suitable for cable gland M20
Wire cross-section	3 x min. 1.5 mm^2 to max. 2.5 mm^2 (AWG 16–14)
Flammability class	VW-1 and FT-1
Temperature resistance	Ambient temperature > 60 °C

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

Cable cross-section	Max. 4 mm^2; typ. 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

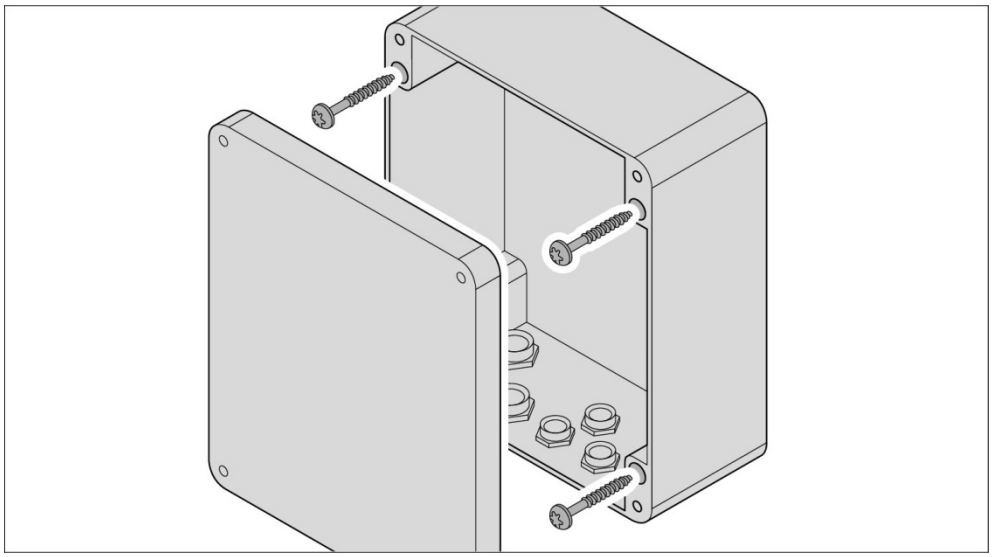
To protect the line voltage supply, proceed as follows:

- 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 isolator must be identified so that the assignment to the supplied device is clearly visible.

Installing the junction box

Junction box without power supply

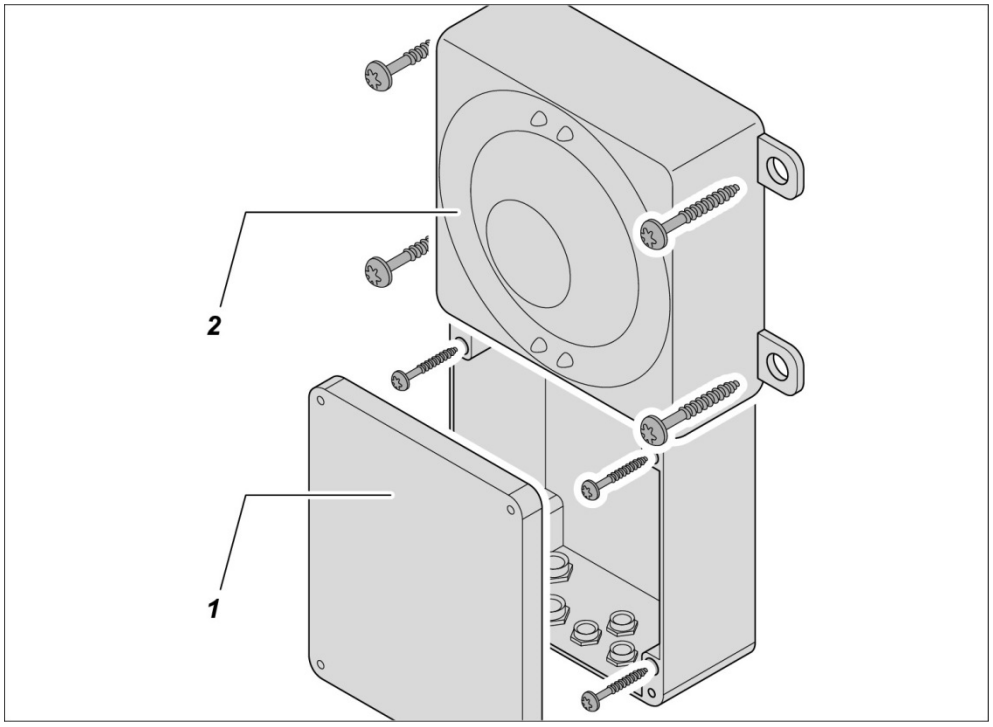
The junction box must be installed with the cable glands facing downward.



Proceed as follows:

Step	Procedure
1	Install the junction box with 4 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 4.5 kg = approx. 18 kg).
2	Close the junction box.

Installing a junction box with a built-in power supply



No.	Meaning
1	Junction box
2	Power supply housing

Proceed as follows:

Step	Procedure
1	Install the junction box and the PSU housing with 8 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 10 kg = approx. 40 kg).
2	Close the junction box.

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.

Important notes on laying the cables and lines

Important notes

- All cables must be installed securely.
- If there is a danger of explosion due to dust, precautionary measures must be taken to prevent the development of static charges on the surface of cables and leads.

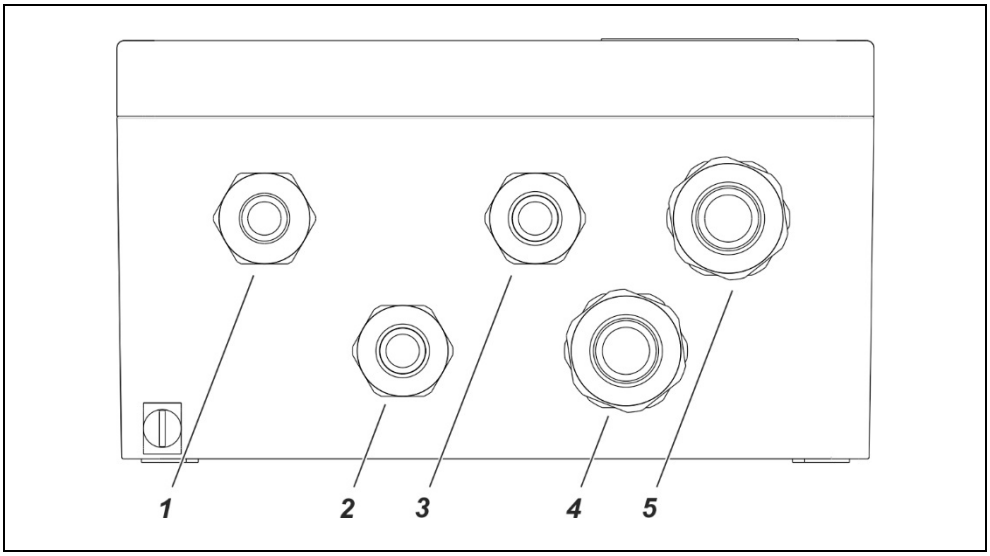
Selecting a suitable cable gland

Selecting a suitable cable gland

Select a suitable cable gland for each cable.

The following always applies:

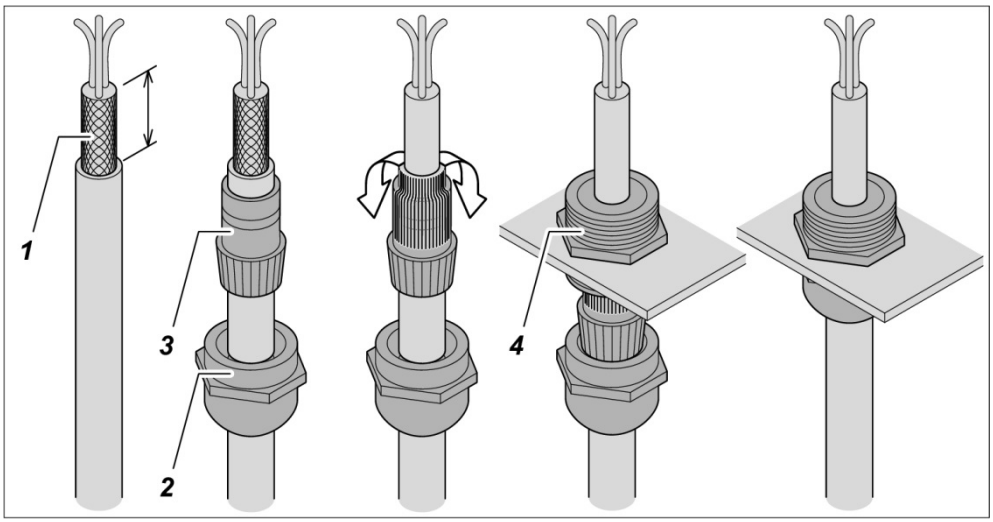
- Shielded cables must only be routed through metal cable glands.
- The cable diameter must fit the diameter of the cable gland.



No.	Cables	Cable gland	Diameter
1	Power supply	M20 metal	6–12 mm
2	T/P probes	M20 metal	7–12 mm
3	Analog and digital outputs	M20 metal	7–12 mm
4	Receiver unit	M25 metal	10–16 mm
5	Transmitter unit	M25 metal	10–16 mm

Leading cables through cable glands

Metal cable glands



No.	Meaning
1	Braided shield
2	Union nut
3	Terminal insert
4	Gland base

Proceed as follows:

Step	Procedure
1	Expose 10 mm of the braided shield.
2	Feed the cable through the union nut and the terminal insert.
3	Slip the braided shield over the terminal insert so that it covers 2 mm of the sealing ring.
4	Feed the cable through the gland base. Ensure that the twisted cable wires remain twisted together.
5	Screw the union nut onto the gland base. Tightening torques: M20 T/P probes and analog/digital outputs: 9–10 Nm M25 connection cable transmitter/receiver unit: 10–12 Nm

Unused cable ends in explosion-proof components

In order to ensure explosion protection, deal with unused cables using one of the following methods:

- Insulate and fix each individual wire end
- Connect the end of each individual wire to the local potential equalization terminal
- Position the ends of each unused wire on an unused terminal

Unused cable glands

In order to ensure the explosion protection: Keep unused cable glands sealed.

Sealing the junction box

In order to ensure explosion protection, close the junction box after connecting the components to ensure that it is gas-proof and dust-proof.

Connecting the electrical leads

Ensuring safety

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Establishing a protective grounding

Establishing a protective grounding

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

Proceed as follows:

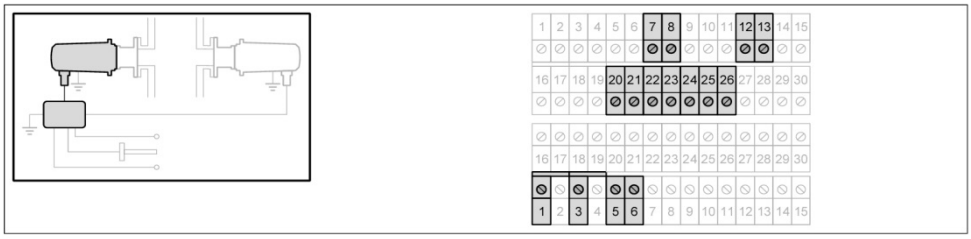
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

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–

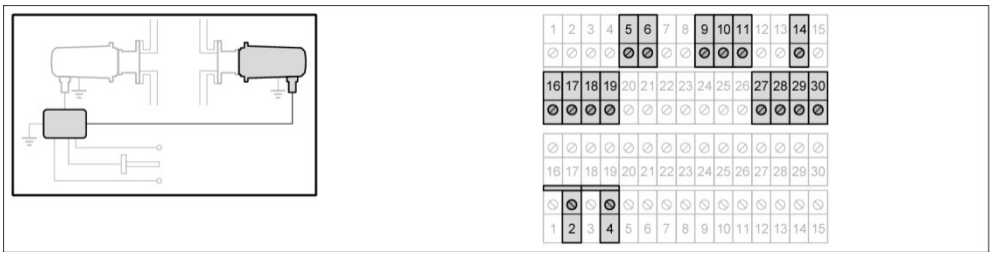
1) In order to ensure explosion protection, deal with these unused wires using one of the following methods:
   - Insulate and fix the individual wire end
   - Connect the end of the wire to the local potential equalization terminal
   - Position the end of the wire on an unused terminal

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
14	Blue	AO3 (4–20 mA)
11	Red	AUX_IO
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

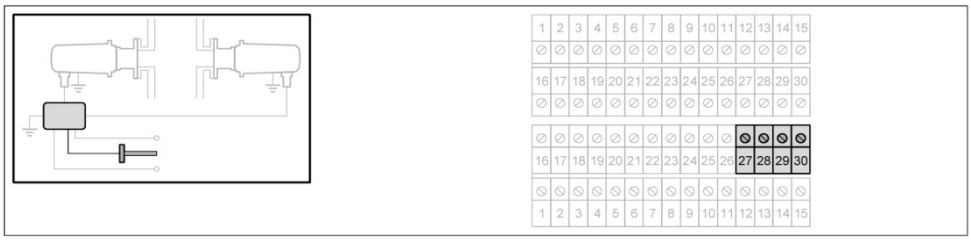
Option: Connecting the T/P probes to the junction box

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.



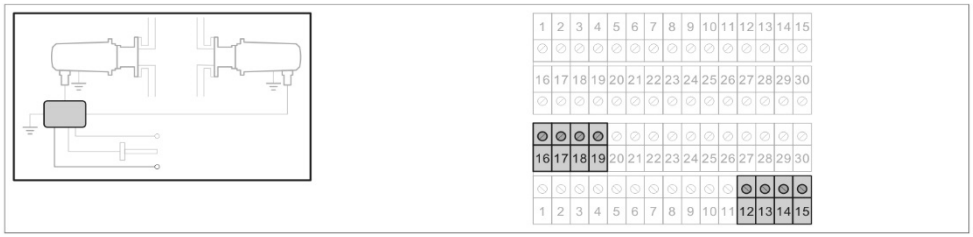
Connections to the terminal strip are made as follows:

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 (4–20 mA)	Analog output 1
13	AO2 (4–20 mA)	Analog output 2
14	AO3 (4–20 mA)	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 (see page 173).

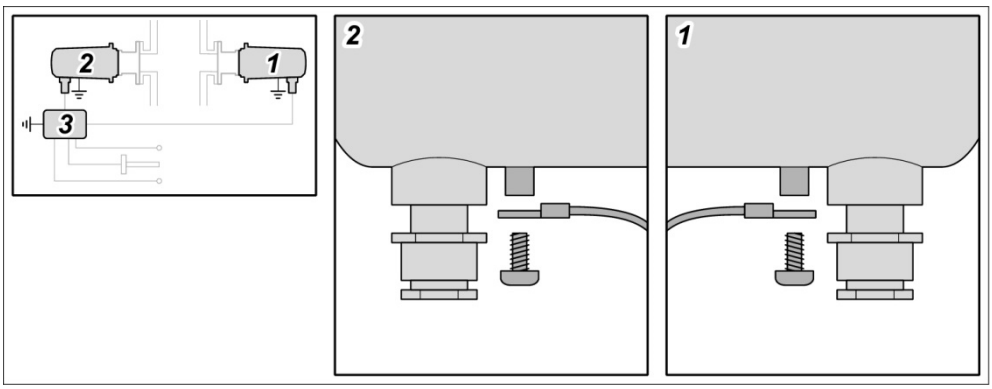
Connecting the potential equalization terminal

Connecting the potential equalization terminal

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!

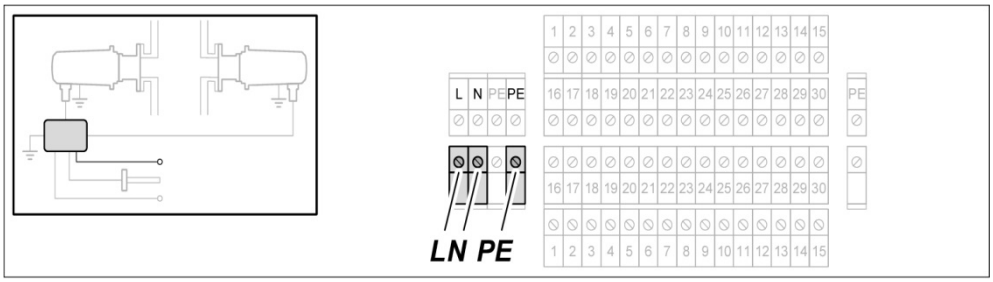
Note the cable specification

Infrared laser beam invisible to the human eye.

Risk of eye injury in the event of accidental startup.

Keep device disconnected until final inspection.

Junction box with power supply: Connecting the AC 100–240 V power supply



Connections to the power supply unit are made as follows:

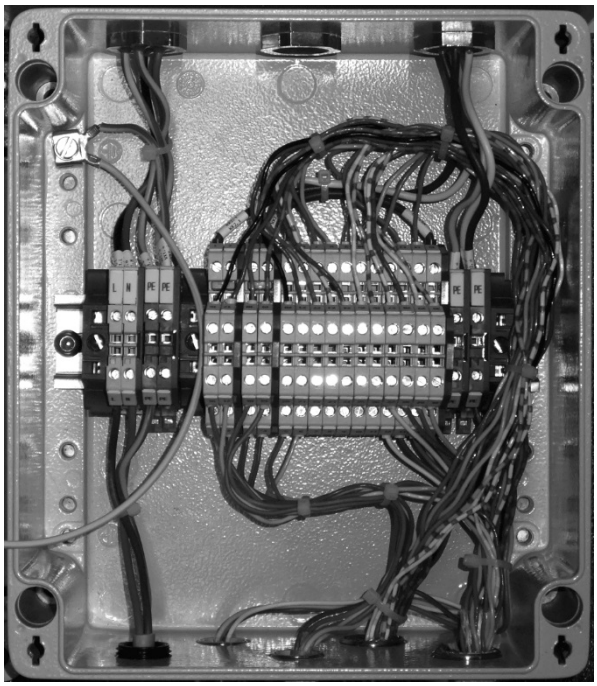
Terminal	Cable wire color	Component	Function
PE	Green/yellow	PE terminal	Protective earth
L	Brown	L terminal	AC 100–240 V (phase)
N	Blue	N terminal	AC 100–240 V (neutral)

Tightening torque of the screw terminals: 0.5–0.6 Nm

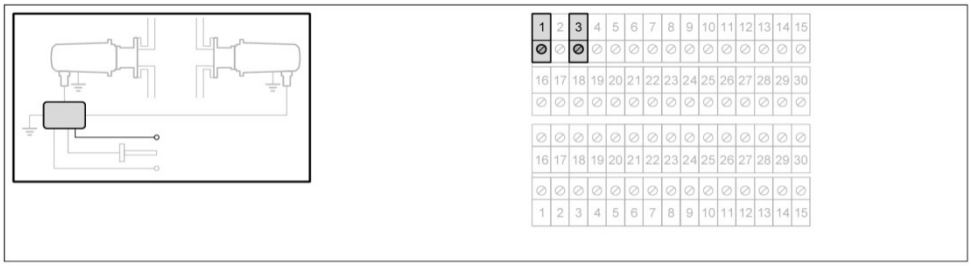
On the secondary side, the connection between the power supply unit and the terminal strip is already wired at the factory.

Laying lines safely

Within the junction box, as shown in the figure, the primary lines and the secondary lines must be laid at a distance and secured with cable ties in such a way that contact between them is excluded.



Junction box without power supply: Connecting the DC 24 V power supply



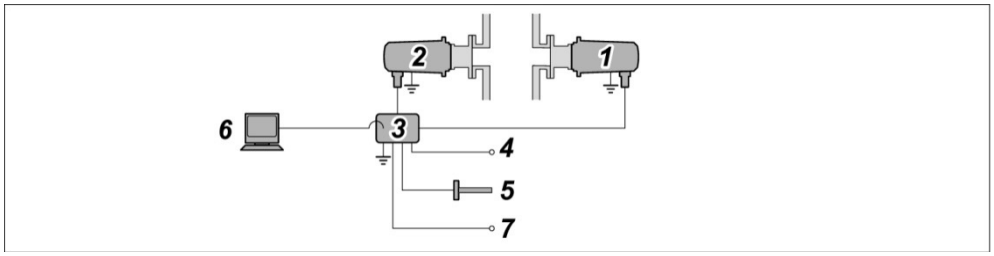
Connections to the terminal strip are made as follows:

Terminal	Cable wire color	Function
1	White	DC 24 V
3	Brown	GND

IECEx variant: Electrical connections

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

⚠ **The ABB declarations regarding explosion protection relate to the transmitter unit and the receiver unit. The current declarations and safety instructions of the relevant manufacturer must be observed with regard to the junction box and its installation.**

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.

Please note:

- The connection cables must only be replaced with genuine replacement cables.
- The connection cables may be shortened to a remaining minimum length of 1.00 m.

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

Connection cables for T/P probes

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

Connection cables for the power supply

Outer diameter	Min. 7 mm up to max. 12 mm Suitable for cable gland M20
Wire cross-section	3 x min. 1.5 mm^2 to max. 2.5 mm^2 (AWG 16–14)
Flammability class	VW-1 and FT-1
Temperature resistance	Ambient temperature > 60 °C

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

Cable cross-section	Max. 4 mm^2; typ. 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

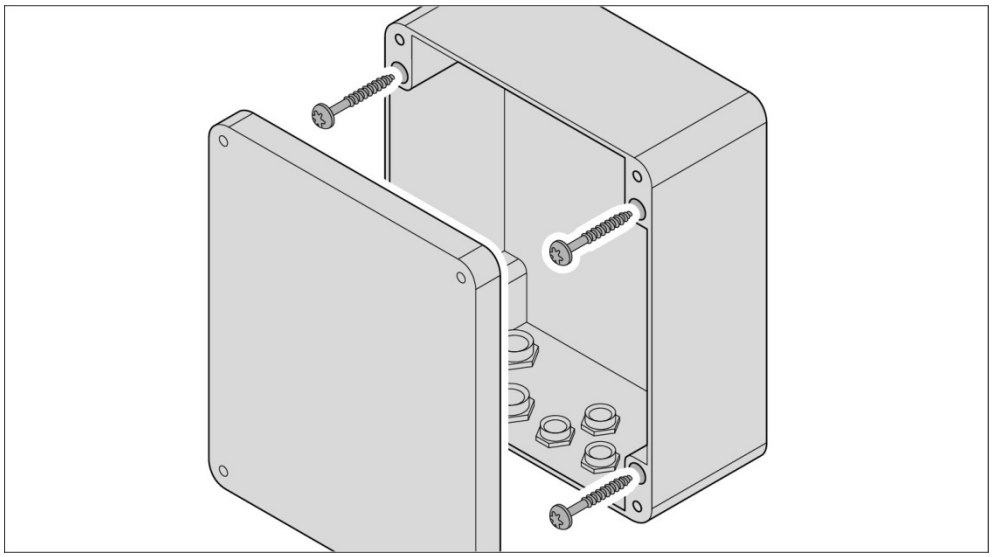
To protect the line voltage supply, proceed as follows:

- 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 isolator must be identified so that the assignment to the supplied device is clearly visible.

Installing the junction box

Junction box without power supply

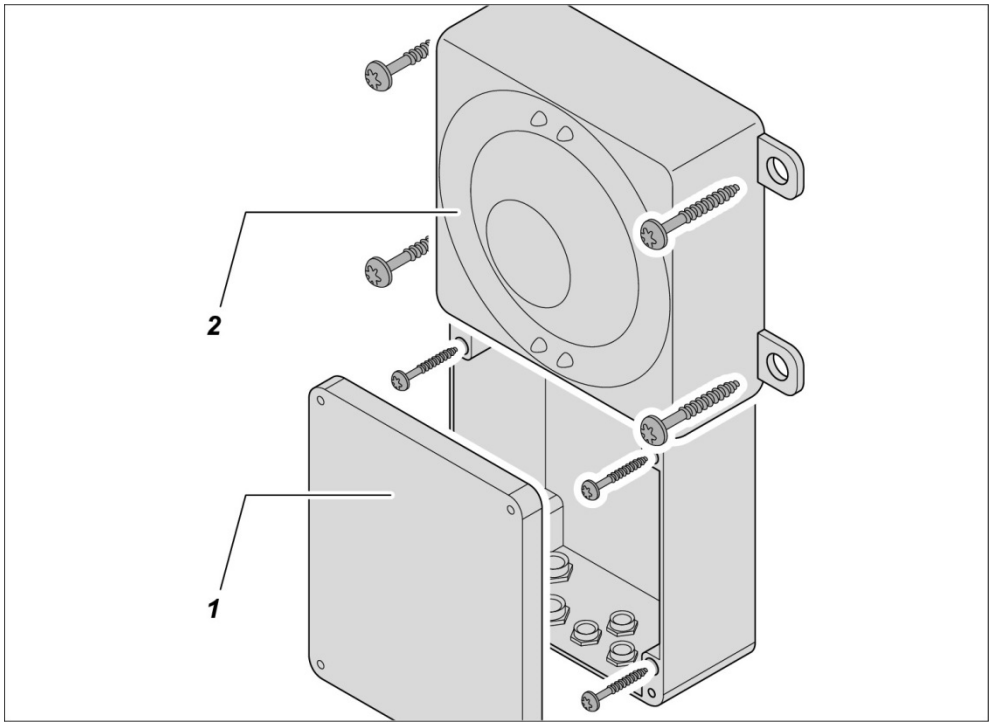
The junction box must be installed with the cable glands facing downward.



Proceed as follows:

Step	Procedure
1	Install the junction box with 4 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 4.5 kg = approx. 18 kg).
2	Close the junction box.

Installing a junction box with a built-in power supply



No.	Meaning
1	Junction box
2	Power supply housing

Proceed as follows:

Step	Procedure
1	Install the junction box and the PSU housing with 8 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 10 kg = approx. 40 kg).
2	Close the junction box.

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.

Important notes on laying the cables and lines

Important notes

- All cables must be installed securely.
- If there is a danger of explosion due to dust, precautionary measures must be taken to prevent the development of static charges on the surface of cables and leads.

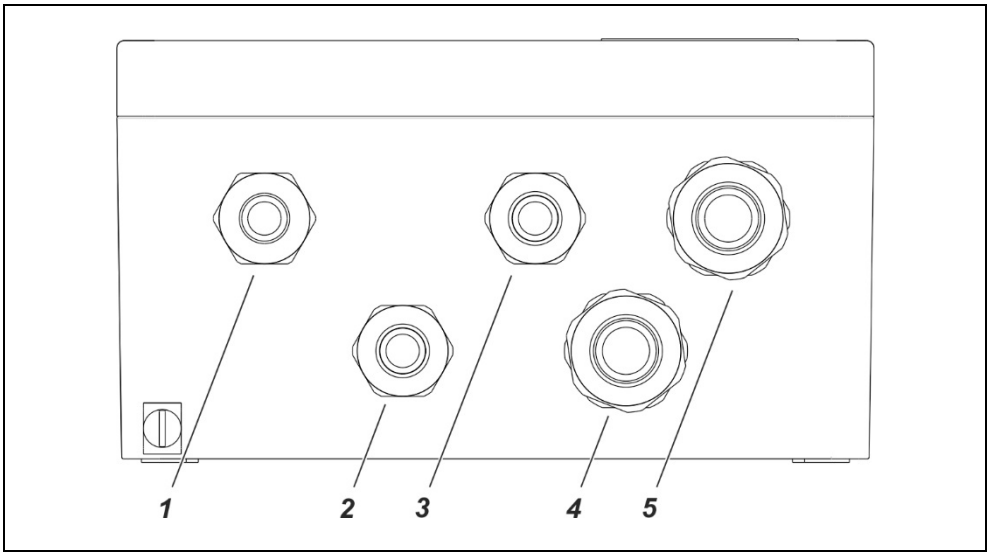
Selecting a suitable cable gland

Selecting a suitable cable gland

Select a suitable cable gland for each cable.

The following always applies:

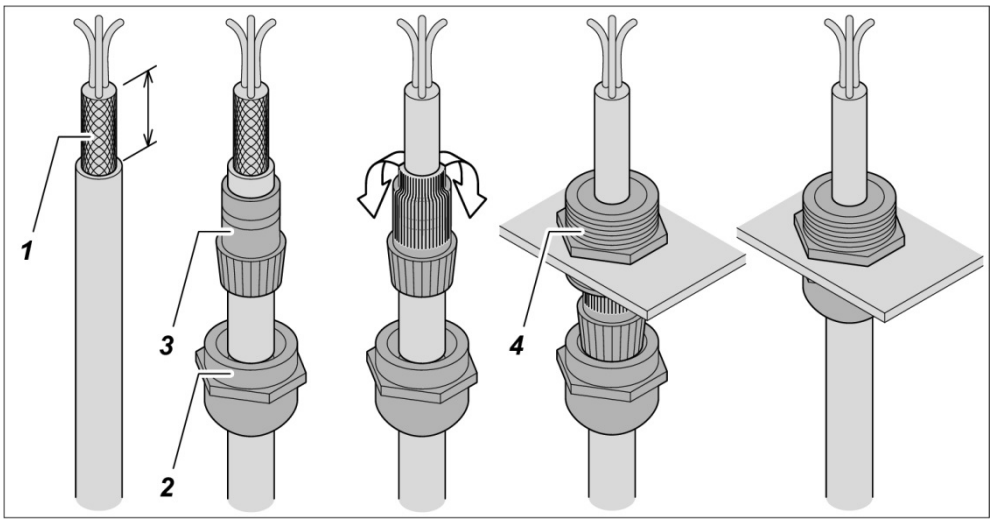
- Shielded cables must only be routed through metal cable glands.
- The cable diameter must fit the diameter of the cable gland.



No.	Cables	Cable gland	Diameter
1	Power supply	M20 metal	6–12 mm
2	T/P probes	M20 metal	7–12 mm
3	Analog and digital outputs	M20 metal	7–12 mm
4	Receiver unit	M25 metal	10–16 mm
5	Transmitter unit	M25 metal	10–16 mm

Leading cables through cable glands

Metal cable glands



No.	Meaning
1	Braided shield
2	Union nut
3	Terminal insert
4	Gland base

Proceed as follows:

Step	Procedure
1	Expose 10 mm of the braided shield.
2	Feed the cable through the union nut and the terminal insert.
3	Slip the braided shield over the terminal insert so that it covers 2 mm of the sealing ring.
4	Feed the cable through the gland base. Ensure that the twisted cable wires remain twisted together.
5	Screw the union nut onto the gland base. Tightening torques: M20 T/P probes and analog/digital outputs: 9–10 Nm M25 connection cable transmitter/receiver unit: 10–12 Nm

Unused cable ends in explosion-proof components

In order to ensure explosion protection, deal with unused cables using one of the following methods:

- Insulate and fix each individual wire end
- Connect the end of each individual wire to the local potential equalization terminal
- Position the ends of each unused wire on an unused terminal

Unused cable glands

In order to ensure the explosion protection: Keep unused cable glands sealed.

Sealing the junction box

In order to ensure explosion protection, close the junction box after connecting the components to ensure that it is gas-proof and dust-proof.

Connecting the electrical leads

Ensuring safety

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Establishing a protective grounding

Establishing a protective grounding

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

Proceed as follows:

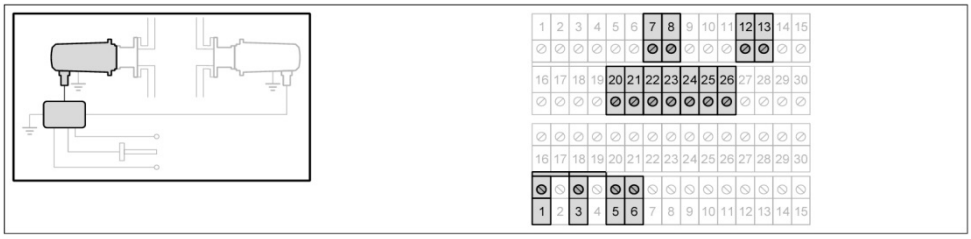
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

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–

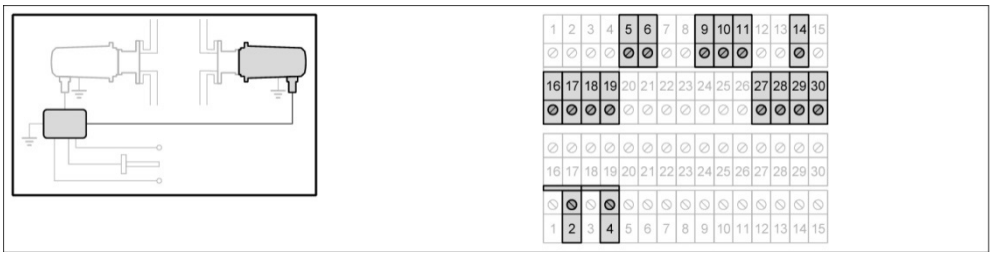
1) In order to ensure explosion protection, deal with these unused wires using one of the following methods:
   - Insulate and fix the individual wire end
   - Connect the end of the wire to the local potential equalization terminal
   - Position the end of the wire on an unused terminal

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
14	Blue	AO3 (4–20 mA)
11	Red	AUX_IO
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

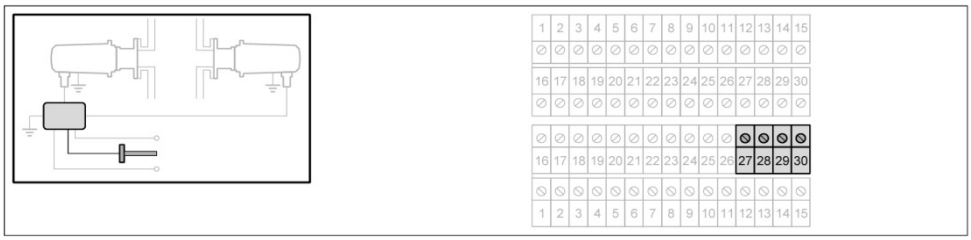
Option: Connecting the T/P probes to the junction box

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.



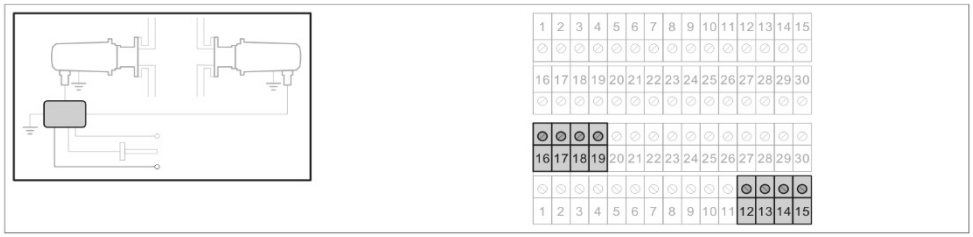
Connections to the terminal strip are made as follows:

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 (4–20 mA)	Analog output 1
13	AO2 (4–20 mA)	Analog output 2
14	AO3 (4–20 mA)	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 (see page 173).

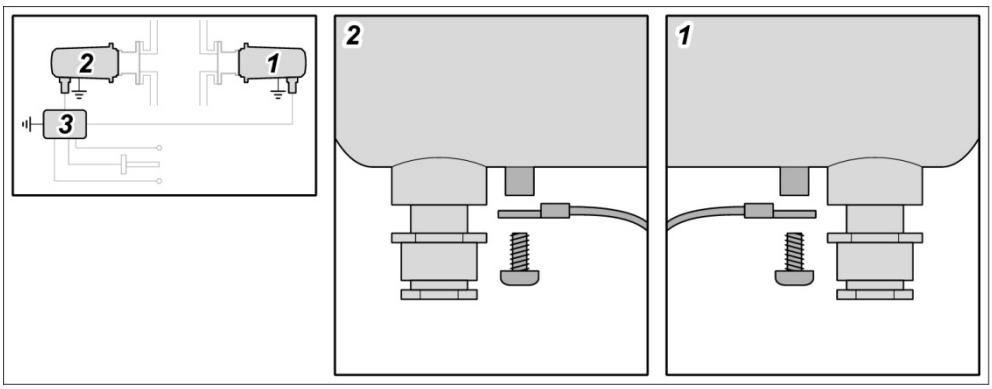
Connecting the potential equalization terminal

Connecting the potential equalization terminal

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!

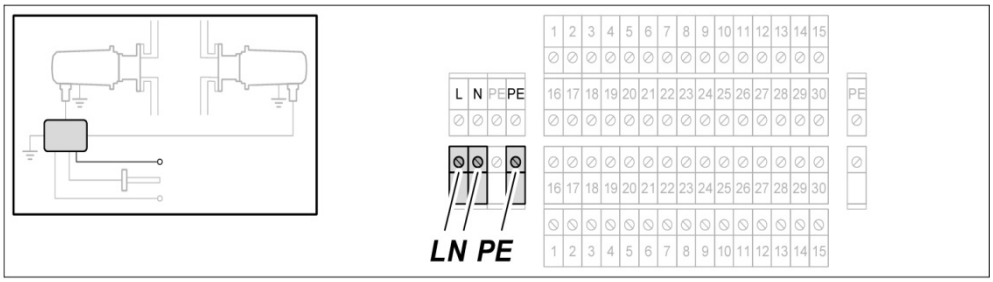
Note the cable specification

Infrared laser beam invisible to the human eye.

Risk of eye injury in the event of accidental startup.

Keep device disconnected until final inspection.

Junction box with power supply: Connecting the AC 100–240 V power supply



Connections to the power supply unit are made as follows:

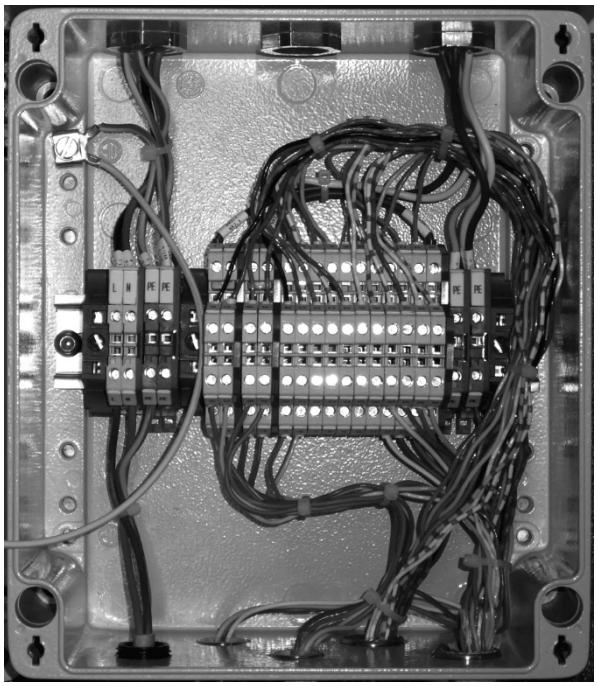
Terminal	Cable wire color	Component	Function
PE	Green/yellow	PE terminal	Protective earth
L	Brown	L terminal	AC 100–240 V (phase)
N	Blue	N terminal	AC 100–240 V (neutral)

Tightening torque of the screw terminals: 0.5–0.6 Nm

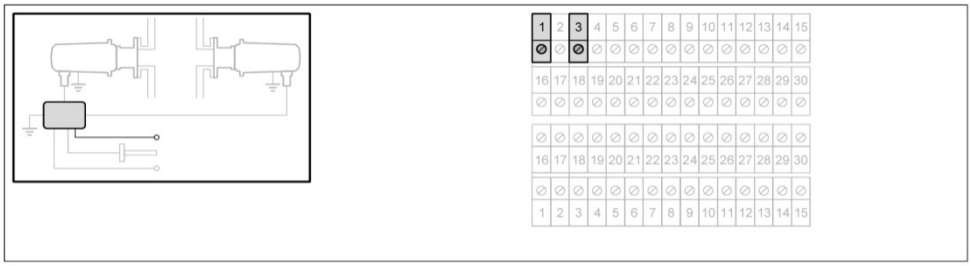
On the secondary side, the connection between the power supply unit and the terminal strip is already wired at the factory.

Laying lines safely

Within the junction box, as shown in the figure, the primary lines and the secondary lines must be laid at a distance and secured with cable ties in such a way that contact between them is excluded.



Junction box without power supply: Connecting the DC 24 V power supply



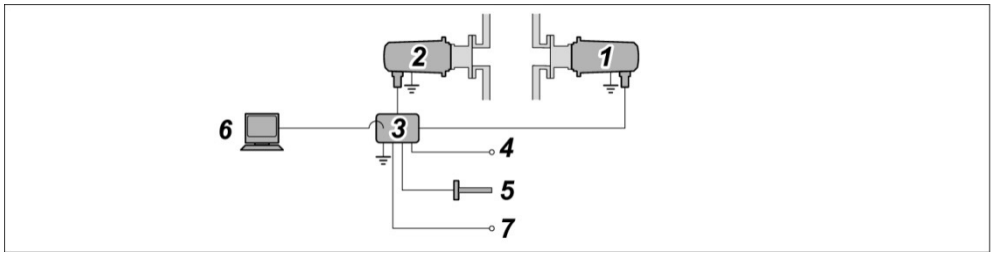
Connections to the terminal strip are made as follows:

Terminal	Cable wire color	Function
1	White	DC 24 V
3	Brown	GND

KCs variant: Electrical connections

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

⚠ **The ABB declarations regarding explosion protection relate to the transmitter unit and the receiver unit. The current declarations and safety instructions of the relevant manufacturer must be observed with regard to the junction box and its installation.**

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.

Please note:

- The connection cables must only be replaced with genuine replacement cables.
- The connection cables may be shortened to a remaining minimum length of 1.00 m.

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

Connection cables for T/P probes

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

Connection cables for the power supply

Outer diameter	Min. 7 mm up to max. 12 mm Suitable for cable gland M20
Wire cross-section	3 x min. 1.5 mm^2 to max. 2.5 mm^2 (AWG 16–14)
Flammability class	VW-1 and FT-1
Temperature resistance	Ambient temperature > 60 °C

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

Cable cross-section	Max. 4 mm^2; typ. 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

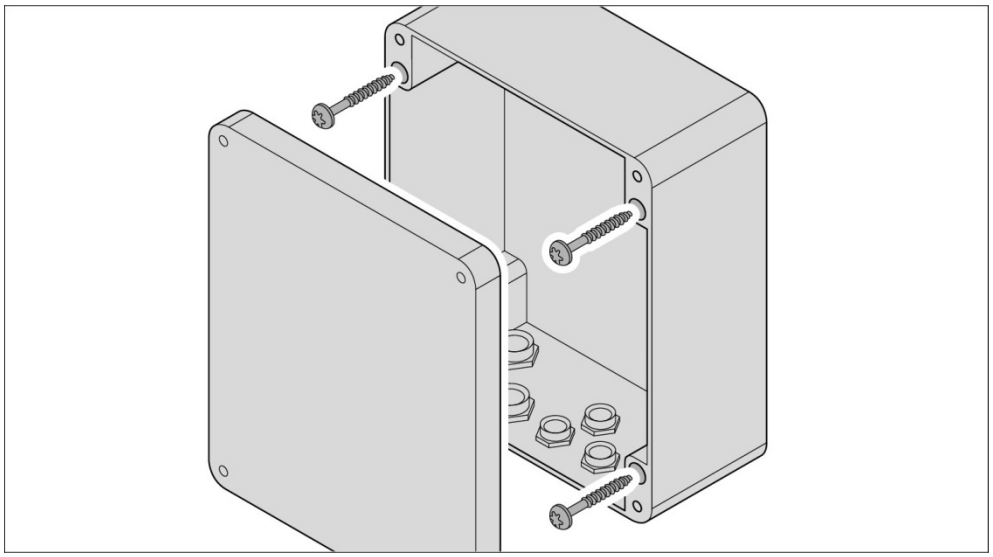
To protect the line voltage supply, proceed as follows:

- 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 isolator must be identified so that the assignment to the supplied device is clearly visible.

Installing the junction box

Junction box without power supply

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



Proceed as follows:

Step	Procedure
1	Install the junction box with 4 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 4.5 kg = approx. 18 kg).
2	Close the junction box.

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.

Important notes on laying the cables and lines

Important notes

- All cables must be installed securely.
- If there is a danger of explosion due to dust, precautionary measures must be taken to prevent the development of static charges on the surface of cables and leads.

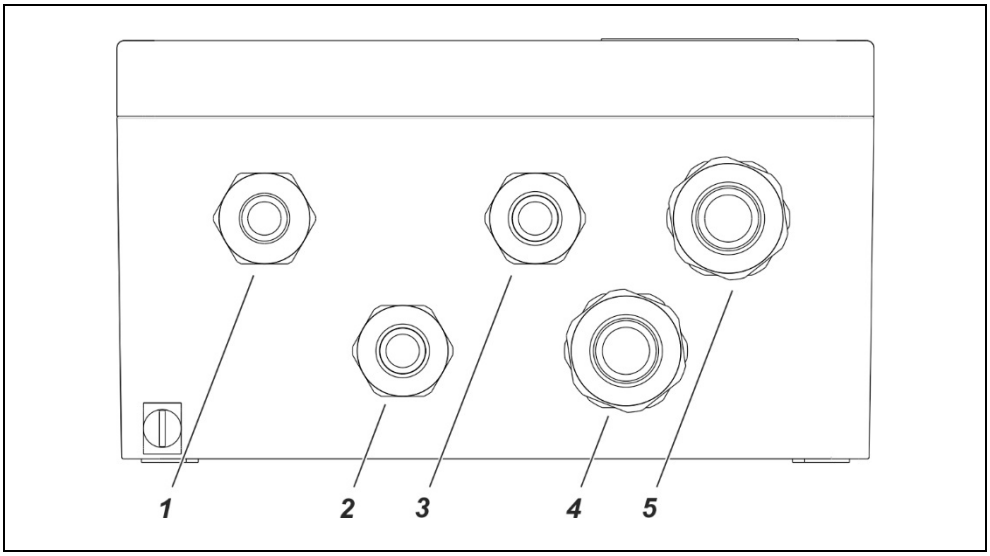
Selecting a suitable cable gland

Selecting a suitable cable gland

Select a suitable cable gland for each cable.

The following always applies:

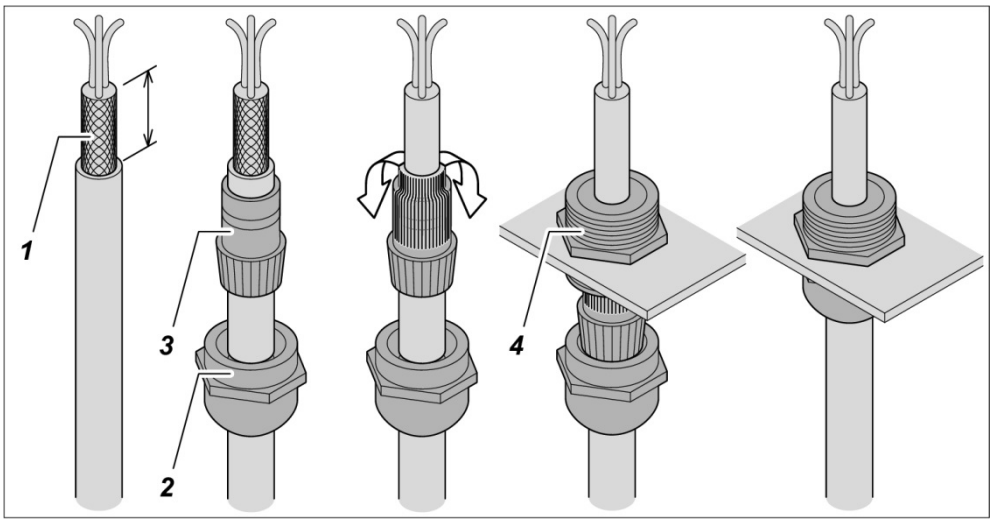
- Shielded cables must only be routed through metal cable glands.
- The cable diameter must fit the diameter of the cable gland.



No.	Cables	Cable gland	Diameter
1	Power supply	M20 metal	6–12 mm
2	T/P probes	M20 metal	7–12 mm
3	Analog and digital outputs	M20 metal	7–12 mm
4	Receiver unit	M25 metal	10–16 mm
5	Transmitter unit	M25 metal	10–16 mm

Leading cables through cable glands

Metal cable glands



No.	Meaning
1	Braided shield
2	Union nut
3	Terminal insert
4	Gland base

Proceed as follows:

Step	Procedure
1	Expose 10 mm of the braided shield.
2	Feed the cable through the union nut and the terminal insert.
3	Slip the braided shield over the terminal insert so that it covers 2 mm of the sealing ring.
4	Feed the cable through the gland base. Ensure that the twisted cable wires remain twisted together.
5	Screw the union nut onto the gland base. Tightening torques: M20 T/P probes and analog/digital outputs: 9–10 Nm M25 connection cable transmitter/receiver unit: 10–12 Nm

Unused cable ends in explosion-proof components

In order to ensure explosion protection, deal with unused cables using one of the following methods:

- Insulate and fix each individual wire end
- Connect the end of each individual wire to the local potential equalization terminal
- Position the ends of each unused wire on an unused terminal

Unused cable glands

In order to ensure the explosion protection: Keep unused cable glands sealed.

Sealing the junction box

In order to ensure explosion protection, close the junction box after connecting the components to ensure that it is gas-proof and dust-proof.

Connecting the electrical leads

Ensuring safety

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Establishing a protective grounding

Establishing a protective grounding

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

Proceed as follows:

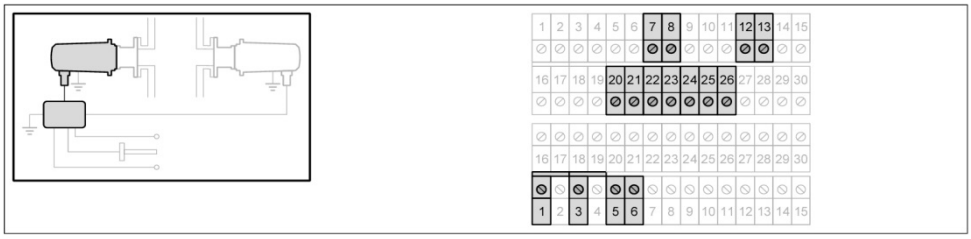
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

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–

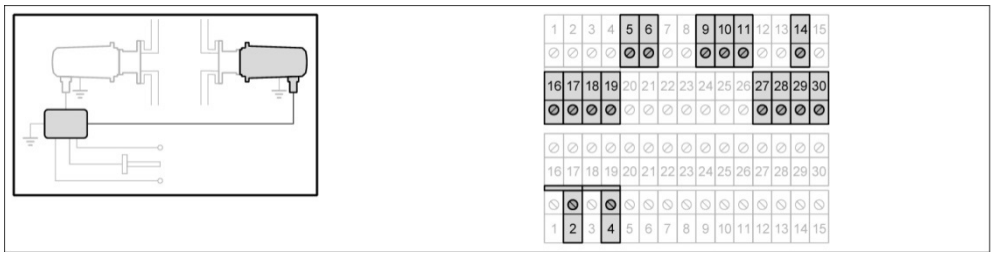
1) In order to ensure explosion protection, deal with these unused wires using one of the following methods:
   - Insulate and fix the individual wire end
   - Connect the end of the wire to the local potential equalization terminal
   - Position the end of the wire on an unused terminal

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
14	Blue	AO3 (4–20 mA)
11	Red	AUX_IO
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

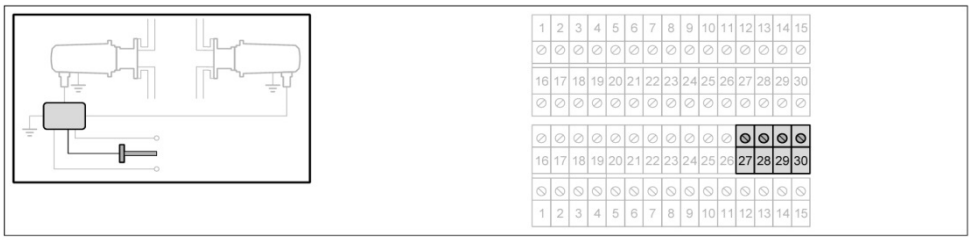
Option: Connecting the T/P probes to the junction box

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.



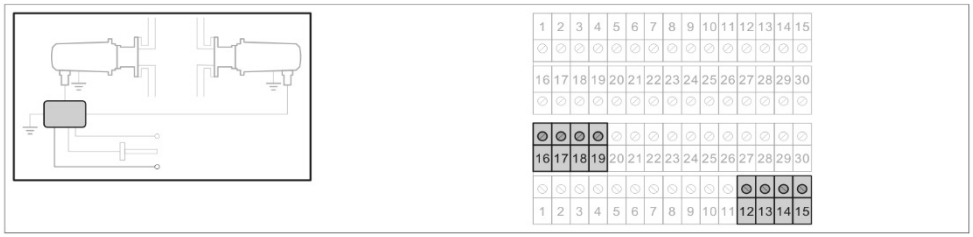
Connections to the terminal strip are made as follows:

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 (4–20 mA)	Analog output 1
13	AO2 (4–20 mA)	Analog output 2
14	AO3 (4–20 mA)	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 (see page 173).

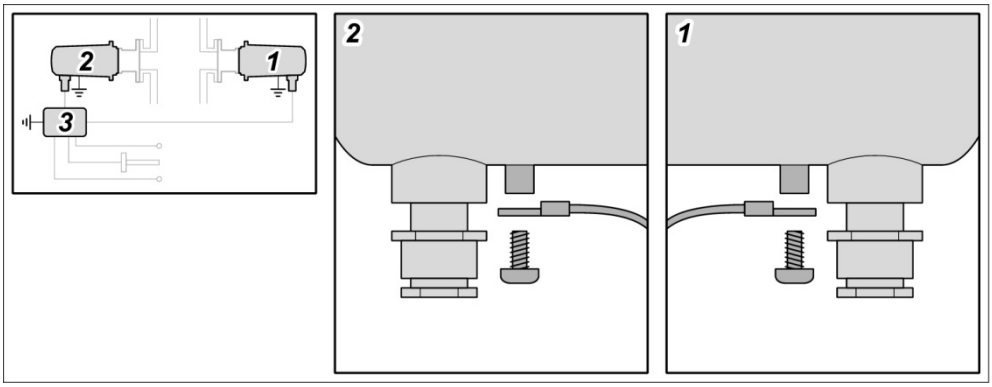
Connecting the potential equalization terminal

Connecting the potential equalization terminal

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

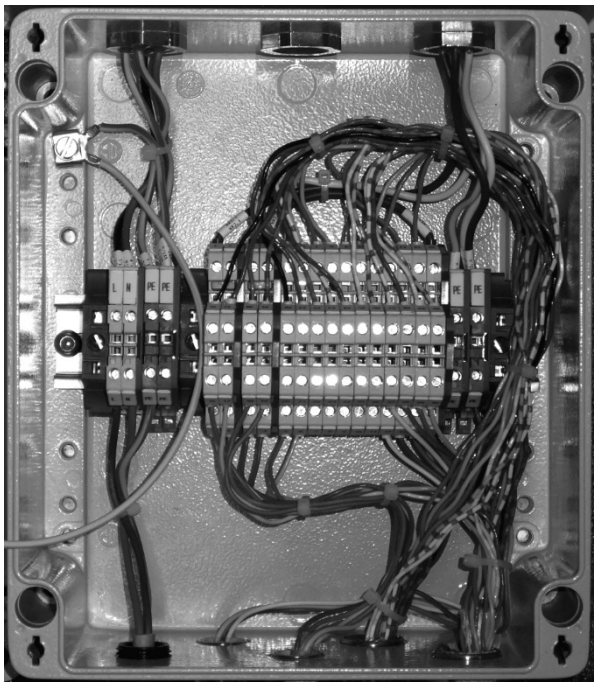
Infrared laser beam invisible to the human eye.

Risk of eye injury in the event of accidental startup.

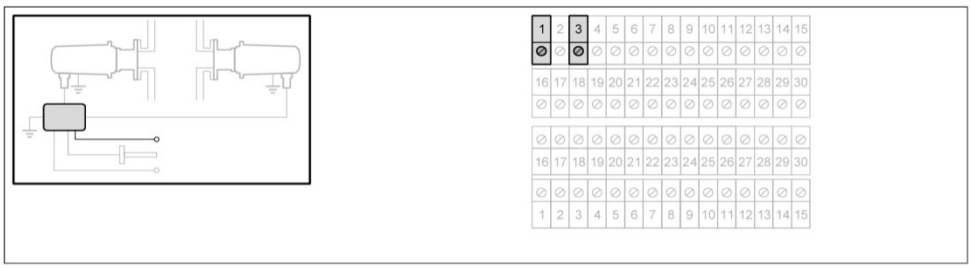
Keep device disconnected until final inspection.

Laying lines safely

Within the junction box, as shown in the figure, the lines must be secured with cable ties. (Remark: The figure shows a slightly different variant of the junction box.)



Junction box without power supply: Connecting the DC 24 V power supply

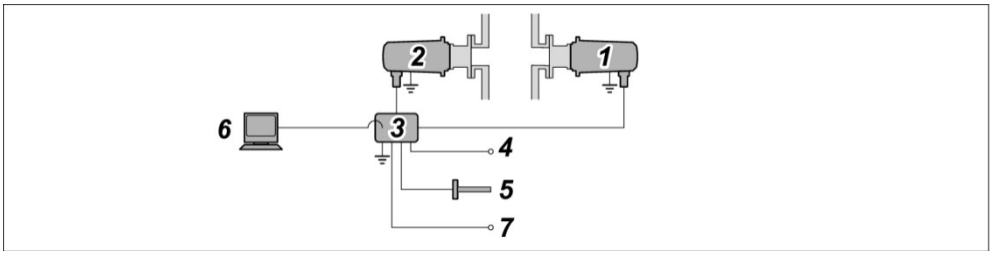


Terminal	Cable wire color	Function
1	White	DC 24 V
3	Brown	GND

CSA variant: Electrical connections

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

⚠ **The ABB declarations regarding explosion protection relate to the transmitter unit and the receiver unit. The current declarations and safety instructions of the relevant manufacturer must be observed with regard to the junction box and its installation.**

When you connect the electrical cables, the provisions in the NEC standard and the local regulations must be observed.

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	MC-HL, 2 x 8 wires, AWG 16
Outer diameter	1.04 inch
Application	Suitable for use in potentially explosive atmospheres Class I, Division 1 / Zone 1
Cable gland	For connection to the junction box, suitable for use in potentially explosive atmospheres Class I, Division 1 / Zone 1, supplied

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

Cable cross-section	Max. 4 mm^2; typ. 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 isolator must be identified so that the assignment to the supplied device is clearly visible.
- Note the built-in fuses in the junction box.

Installing the junction box

Installing the junction box

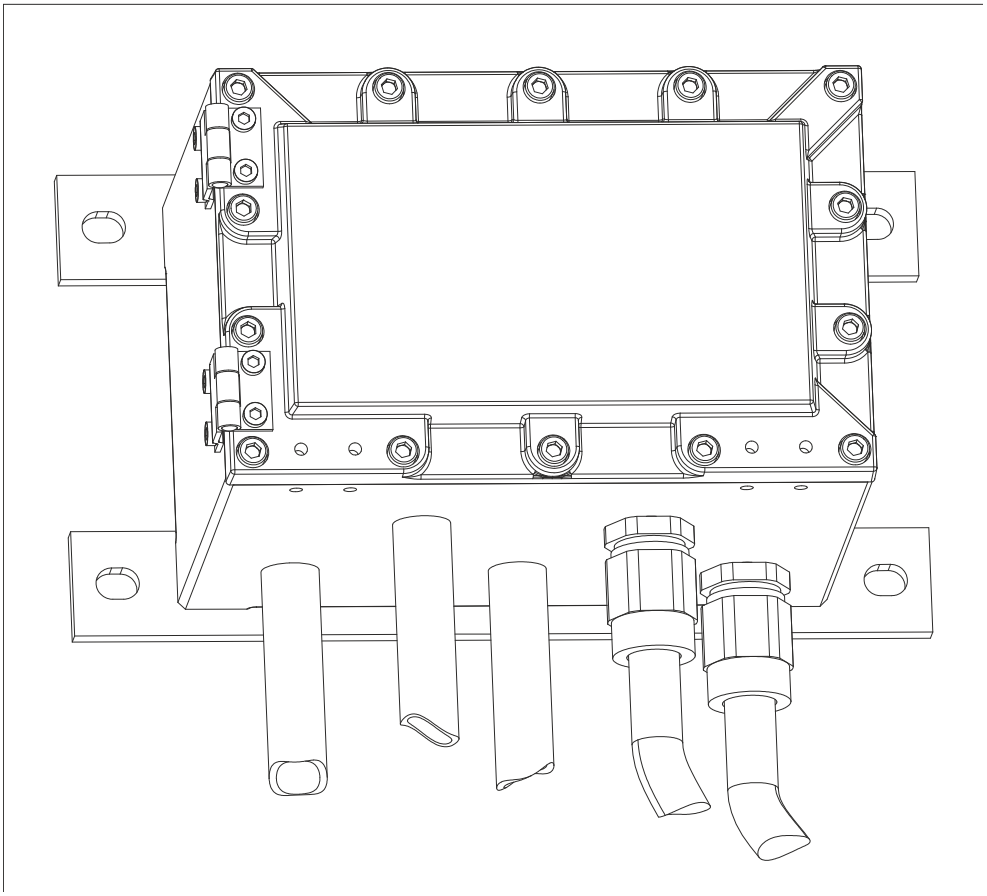
⚠ **When installing the junction box, make sure that the contact surface between the housing and the cover of the junction box is not damaged, for example, by scratches caused by a tool.**

Even very slight damage to the contact surface will result in the loss of the explosion protection! As a result, there is a risk of explosion when operating the junction box!

If the contact surface is damaged, the analyzer must not be put into operation under any circumstances, and the junction box must be replaced!

⚠ **The junction box weighs approximately 28 kilograms. Two persons are required for the transporting and assembly operations!**

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



Step	Procedure
1	Install the junction box with 4 appropriate fittings. For the installation, use suitable screws and dowels for securely bearing four times the weight of the junction box (4 x approx. 28 kg = approx. 120 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

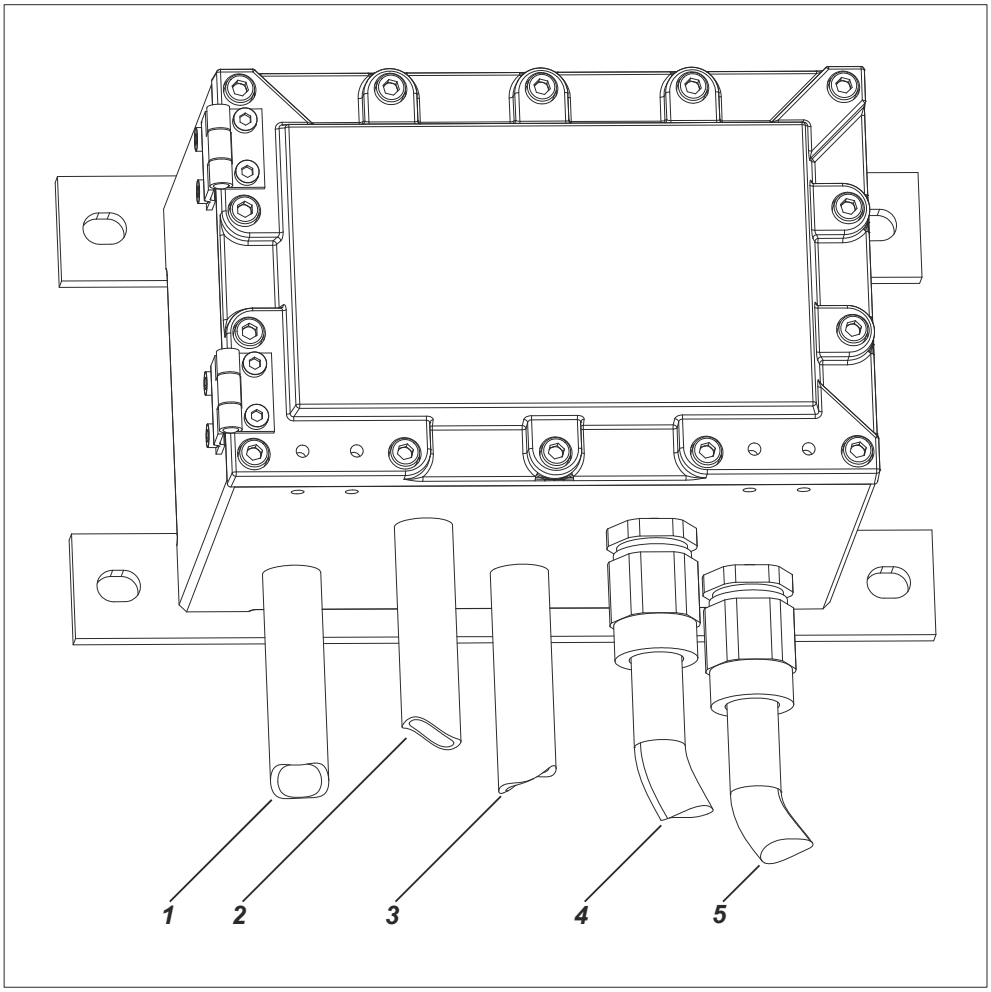
Select a suitable cable gland

The junction box with a built-in power supply has its own certification from the supplier.

Select a suitable cable gland for each cable.

The following always applies:

- The cable glands are designed with ¾-inch NPT thread.
- Flameproof cable or conduit glands must be used.



The numbers have the following meaning:

No.	Cables
1	Power supply
2	T/P probes
3	Analog and digital outputs
4	Receiver unit
5	Transmitter unit

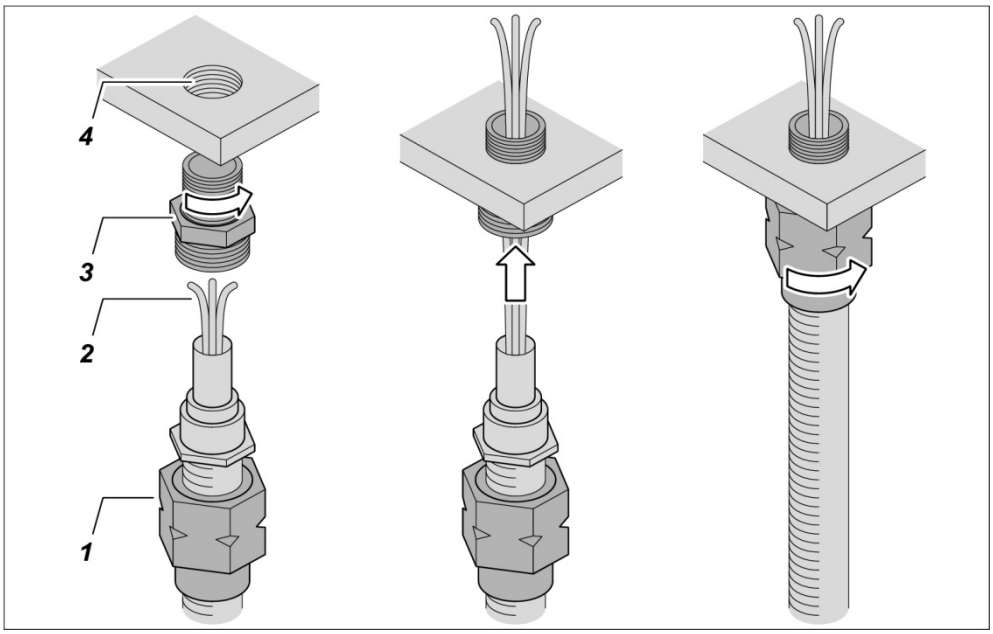
Leading cables through cable glands

Connection cable for the transmitter unit and receiver unit

The cable glands to connect the connection cable for the transmitter unit and the receiver unit to the junction box are included with the gas analyzer. However, they are not covered by the certification issued to ABB with regard to explosion protection.

When you handle the cable glands and the connection cables, the provisions in the NEC standard and the local regulations must be observed.

The following figure and the following instructions describe the main steps for installing the cable glands and feeding the connection cable into the junction box. In addition, it is essential that you observe the detailed installation manual from the manufacturer of the cable glands, including the instructions for handling the potting compound (included with the gas analyzer).



No.	Meaning
1	Union nut (outer nut)
2	Wire bundle
3	Connection socket (entry item)
4	¾ inch NPT internal thread of the junction box

Read the installation manual from the manufacturer of the cable glands before beginning installation.

Proceed as follows:

Step	Procedure
1	Disassemble the cable gland.
2	Remove the insulation and the sheath from the connection cable. When doing so, ensure that the black and white cable pairs stay together.
3	Run the connection cable through the disassembled cable gland.
4	Make up the potting compound, and insert it between the wires of the connection cable, both around the wires and in the pipe fittings provided. Remove the excess potting compound.
5	Run the connection cable through the connection socket and let the potting compound harden.
6	Screw the connection socket into the internal thread of the junction box.
7	Feed the wire bundle through the connection socket and into the junction box. When doing so, also ensure that the black and white cable pairs stay together. It is recommended that you number the wires before connecting them to the terminal block with the labeling clips included in accordance with the tables on pages 146 and 147 according to the terminal number. The number of the wire pair is printed on each white wire.
8	Attach the connection cable to the junction box by screwing the union nut onto the connection socket.

Other connection cables

In potentially explosive atmospheres, use suitable conduits to connect the analog and digital outputs, the T/P-probes and the power supply.

Note the regulations of the NEC standard or local regulations regarding the specifications and installation of the cables, as well as the sealing of the cable glands.

Unused cable ends in explosion-proof components

In order to ensure explosion protection, deal with unused cables using one of the following methods:

- Insulate and fix each individual wire end
- Connect the end of each individual wire to the local potential equalization terminal
- Position the ends of each unused wire on an unused terminal

Unused cable glands

In order to ensure the explosion protection: Keep unused cable glands sealed.

Sealing the junction box

To guarantee explosion protection, close the junction box after connecting the components.

Connecting the electrical leads

Ensuring safety

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

⚠ **When connecting the electrical connections, make sure that the contact surface between the housing and the cover of the junction box is not damaged, for example, by scratches caused by a tool.**

Even very slight damage to the contact surface will result in the loss of the explosion protection! As a result, there is a risk of explosion when operating the junction box!

If the contact surface is damaged, the analyzer must not be put into operation under any circumstances, and the junction box must be replaced!

Establishing a protective grounding

Establishing a protective grounding

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

Proceed as follows:

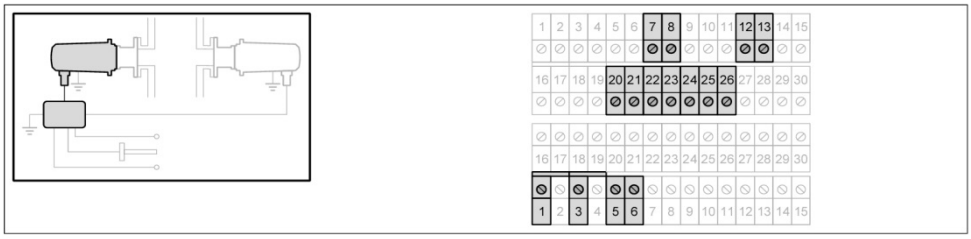
Step	Procedure
1	Connect the PE conductor of the power cable to the PE terminal of the terminal strip.

Connecting the transmitter unit to the junction box

Connecting the transmitter unit

Connect the transmitter unit to the junction box.

It is recommended that you number the wires of the connection cable, in order to facilitate the assignment to the terminals (see page 143).



Connections to the terminal strip are made as follows:

Terminal	MC-HL cable wire color	Wire pair no.	Function
1	White	1	+24 V
3	Black	1	GND
5	White	2	TURU_A
6	Black	2	TURU_B
7	White	3	AUX_A
8	Black	3	AUX_B
12	White	4	AO1 (4–20 mA)
13	Black	4	AO2 (4–20 mA)
20	White	5	INTERNAL
21	Black	5	INTERNAL
22	White	6	INTERNAL
–	Black [1)]	6	(not assigned)
23	White	7	ETH_TX+
24	Black	7	ETH_TX–
25	White	8	ETH_RX+
26	Black	8	ETH_RX–

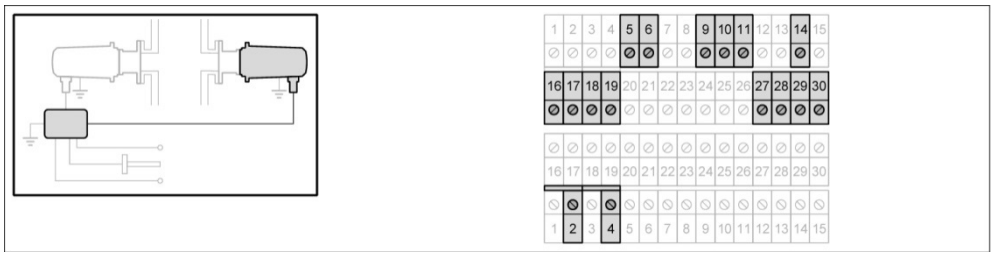
1) In order to ensure explosion protection, deal with these unused wires using one of the following methods:
   - Insulate and fix the individual wire end
   - Connect the end of the wire to the local potential equalization terminal
   - Position the end of the wire on an unused terminal

Connecting the receiver unit to the junction box

Connecting the receiver unit

Connect the receiver unit to the junction box.

It is recommended that you number the wires of the connection cable, in order to facilitate the assignment to the terminals (see page 143).



Connections to the terminal strip are made as follows:

Terminal	MC-HL cable wire color	Wire pair no.	Function
2	White	1	+24 V
4	Black	1	GND
5	White	2	TURU_A
6	Black	2	TURU_B
9	White	3	AUXIF_A
10	Black	3	AUXIF_B
14	White	4	AO3 (4–20 mA)
11	Black	4	AUX_IO
16	White	5	DO1_A
17	Black	5	DO1_B
18	White	6	DO2_A
19	Black	6	DO2_B
27	White	7	T-Probe_in
28	Black	7	T-Probe_out
29	White	8	P-Probe_in
30	Black	8	P-Probe_out

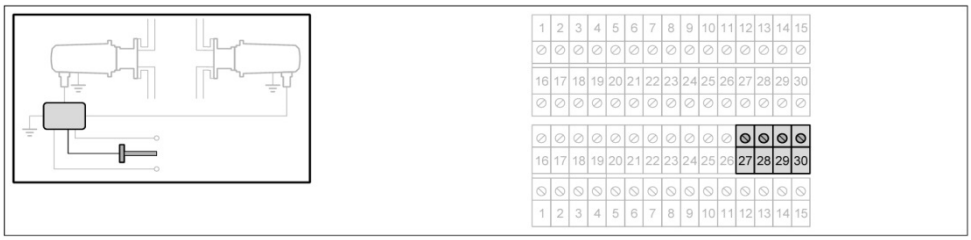
Option: Connecting the T/P probes to the junction box

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.



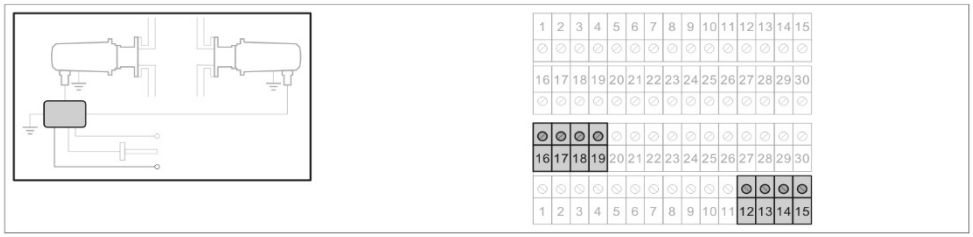
Connections to the terminal strip are made as follows:

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 (4–20 mA)	Analog output 1
13	AO2 (4–20 mA)	Analog output 2
14	AO3 (4–20 mA)	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 (see page 173).

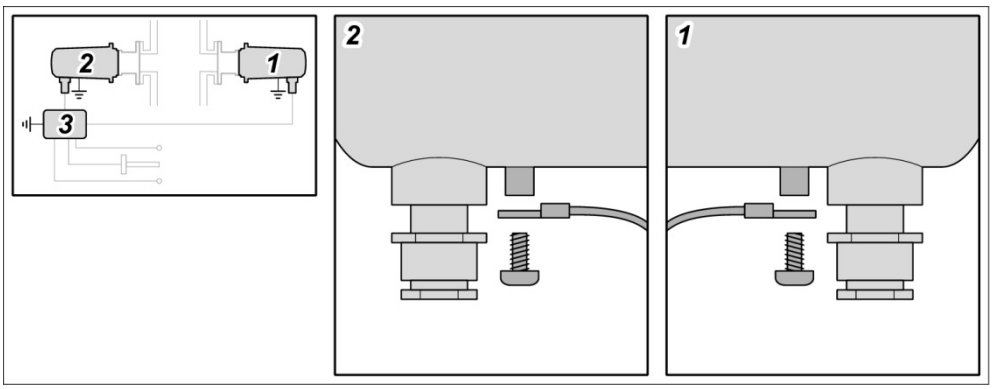
Connecting the potential equalization terminal

Connecting the potential equalization terminal

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!

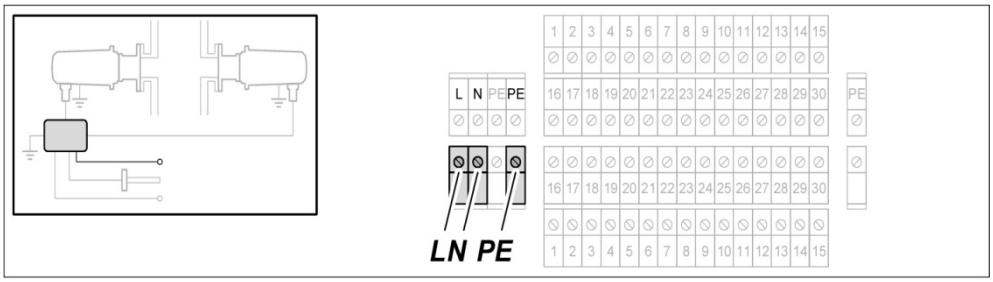
Note the cable specification

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 AC 100–240 V power supply



Connections to the power supply unit are made as follows:

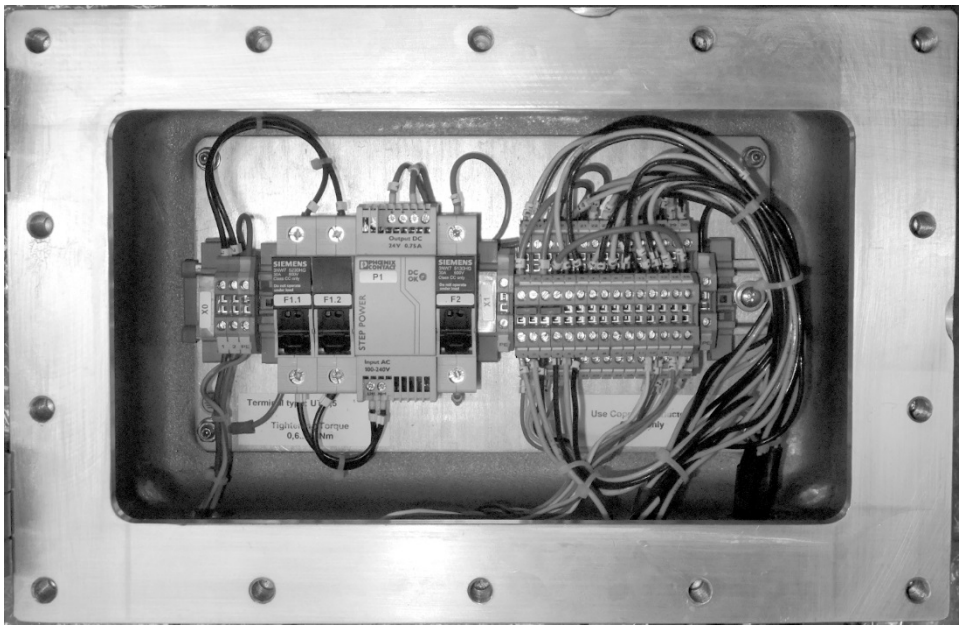
Terminal	Cable wire color	Component	Function
PE	Green/yellow	PE terminal	Protective earth
L	Brown	L terminal	AC 100–240 V (phase)
N	Blue	N terminal	AC 100–240 V (neutral)

Tightening torque of the screw terminals: 0.6–0.8 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

Within the junction box, as shown in the figure, the primary lines and the secondary lines must be laid at a distance and secured with cable ties in such a way that contact between them is excluded.



Gas analyzer start-up

Checking and approving for use

Performing a final check of the analyzer

Ensure that all pre-startup conditions are met.

Proceed in accordance with the following checklists:

Checking the environmental conditions

Test object	Requirement
Transmitter unit, receiver unit, junction box	The environmental conditions are consistent with the following information on the name plate: ▪ Zone ▪ Explosion group ▪ Temperature class ▪ Ambient temperature

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 ▪ All of the fixing screws on the housing cover are present and securely tightened.

Test object	Requirement
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 over-pressure 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.
Cable lengths	For ATEX, IECEx and KCs variants: The cables of the transmitter unit and receiver unit are at least 1.00 m long.
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 terminal 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 ▪ If there is a danger of explosion due to dust, precautionary measures are taken to prevent the development of static charges on the surface of cables and lines.
Cable glands	▪ The cables in the cable glands of 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 status: "Starting-up"

This operating status 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 status: "Initializing"

This status is applies as soon as startup 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 status: "Measuring"

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

Operating status: "Malfunction"

This operating status applies when an error has occurred (also see Error messages in "Malfunction" status on page 206).

Phase	Action
1	An error occurs.
2	An error signal is output at digital output 1.
3	The analyzer ends the measuring process.

Connecting the PC to the junction box

Ensuring safety

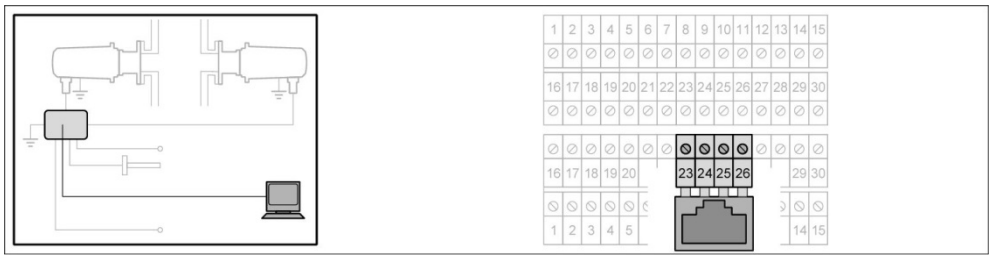
No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

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 an Ethernet 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 receiver unit. It is accessed via a web browser.

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

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

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Connecting the devices

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.

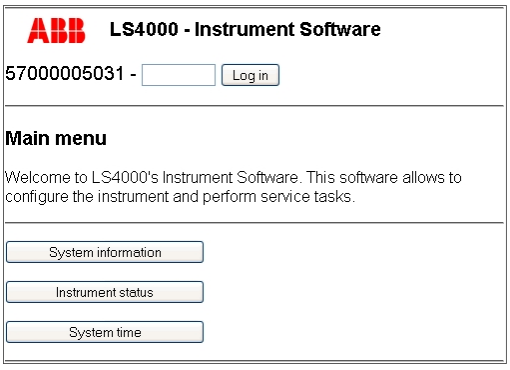
Starting the instrument software

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

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

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:

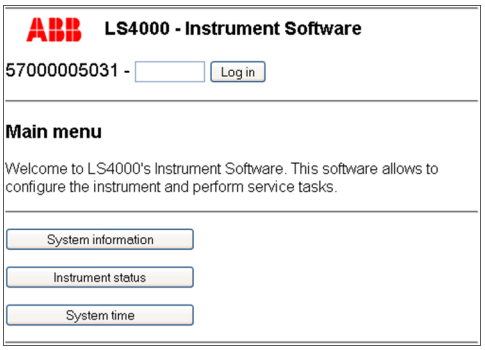


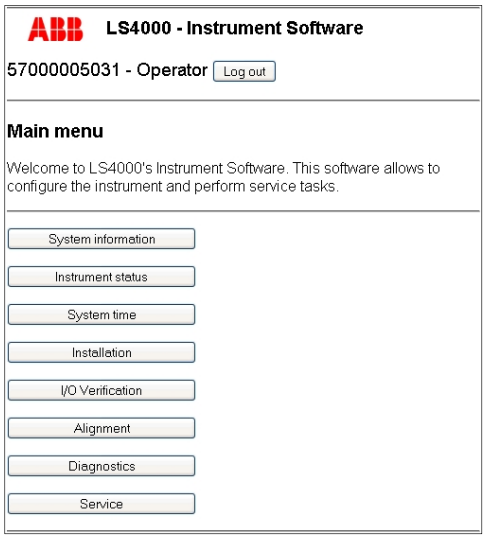
Menu structure of the instrument software

Main menu	
System information	
Instrument status	
System time	
Installation	
	Process parameters
	Installation flanges
	Ambient conditions
	External inputs
	Channels
	Analog and digital outputs
	Network settings
	Save settings
I/O verification	
Alignment	
Diagnostics	
Service	
	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.

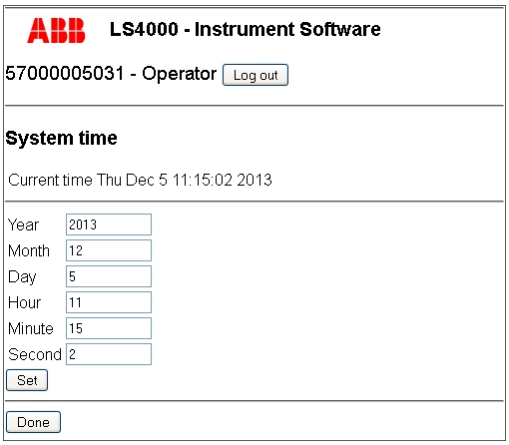
Open menus

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 entering a password	
System information	Open System information menu	without / after
Instrument status	Open Instrument status menu	without / after
System time	Open System time menu	without / after
Installation	Open Installation procedure menu	after
I/O Verification	Open Verification of I/O modules menu	after
Alignment	Open Alignment menu	after
Diagnostics	Open Diagnostics menu	after
Service	Open Service menu	after

The number displayed next to the log-in entry field is the serial number of the laser module in the transmitter unit.

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	Save entries
Done	Exit menu

Fine alignment of the purging flanges

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

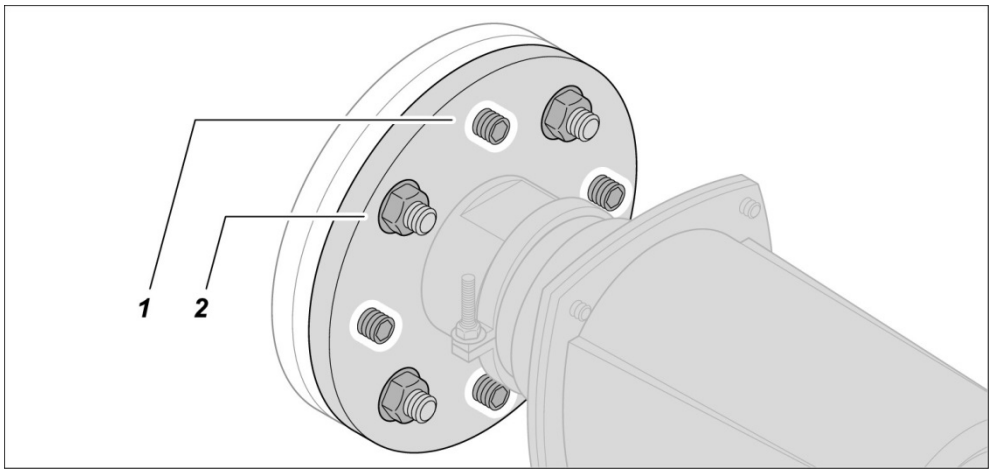
Make sure that no explosive gases or dusts are present when performing this work.

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 164). The "Alignment" menu appears. The current values "Relative transmission" and "Absolute transmission" are displayed.
3	Click on "Align". The analyzer is now ready for fine alignment.

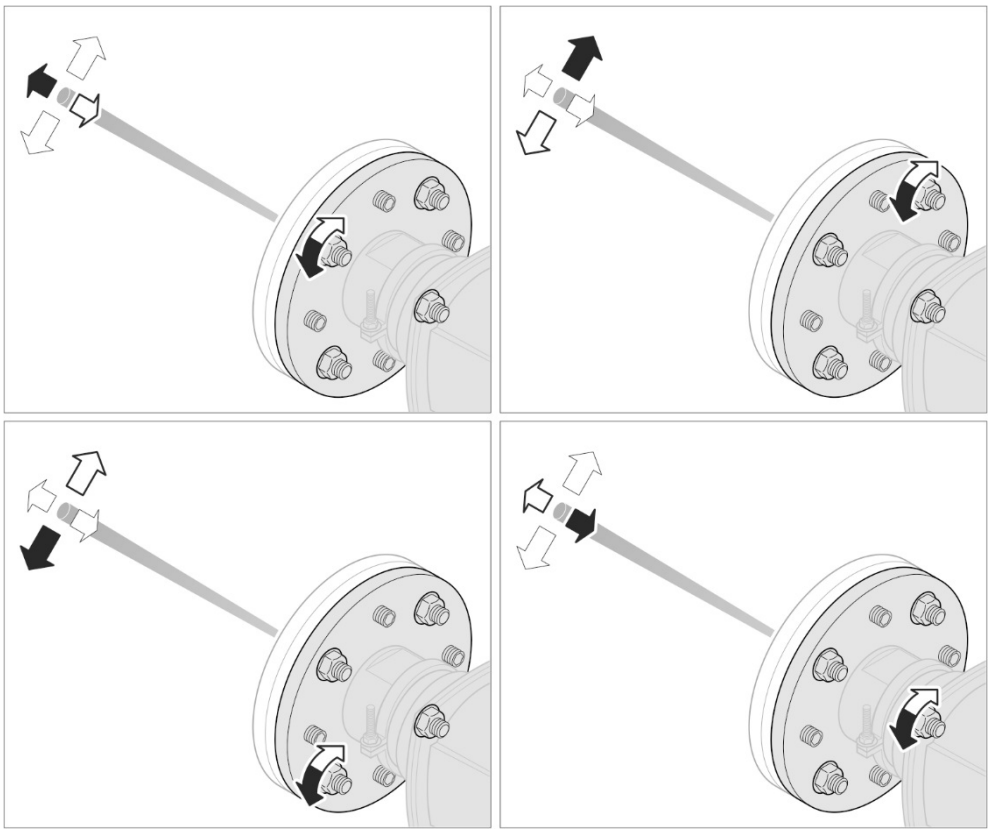
Fine alignment of the purging flanges



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 flange 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

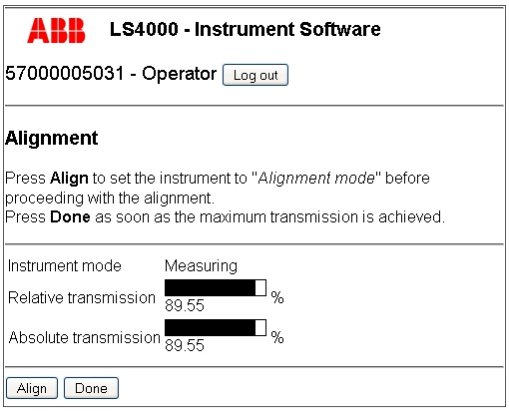
Proceed as follows:

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" in the "Alignment" menu.
3	If you do not want to perform any further tasks on the instrument software, disconnect the RJ45 adapter board from the junction box.
4	To guarantee explosion protection, close the junction box.

Ready to perform measurements

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

Alignment menu



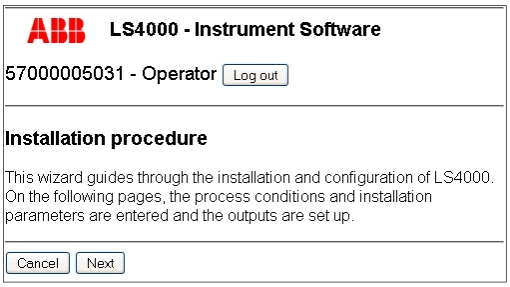
Intended use

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	View the operating status of the analyzer
Relative transmission	View the measured relative transmission
Absolute transmission	View the measured absolute transmission
Align	Start "Fine alignment" instrument mode (see Section Fine alignment of the purging flanges on page 162)
Done	Exit menu

Installation procedure



Intended use

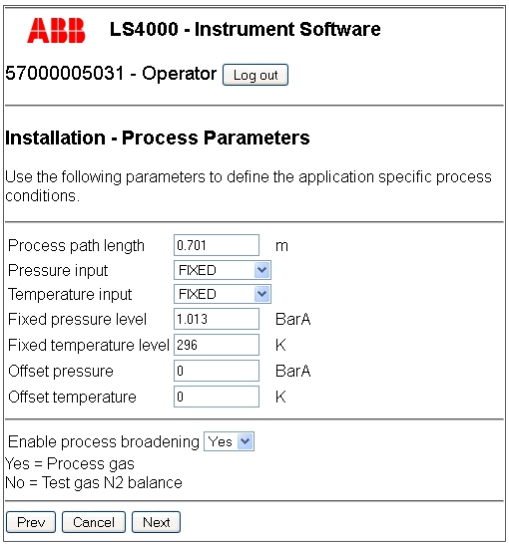
Call up the configuration assistant

Start the 8-step configuration routine

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Cancel	Exit menu
Next	Call up the configuration assistant Start the 8-step configuration routine

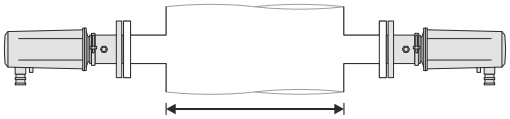
Installation – Process parameters menu



Intended use

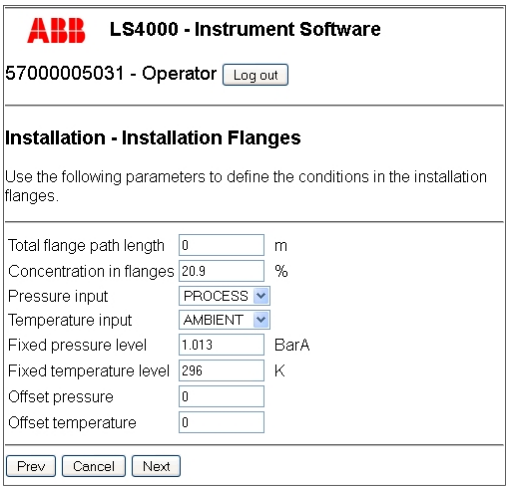
Enter physical properties for the process

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  Process path length When using insertion pipes: Enter the free path length between the insertion pipes
Pressure input	Define the source of the value for the pressure FIXED: Use a manually entered process value EXTERNAL: Use a process value measured by a connected P-probe (see Menu: Installation – External inputs on page 171) 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 EXTERNAL: Use a value measured by a connected T-probe (see Menu: Installation – External inputs on page 171) 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

Name	Meaning/function
Offset pressure	Enter the difference between the measured and actual pressure in the process environment
Offset temperature	Enter the difference between the measured and actual temperature in the environment
Enable process broadening	YES: Process measurement NO: Calibration
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

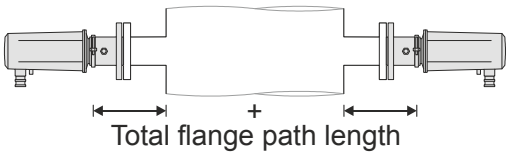
Installation – Installation flanges menu



Intended use

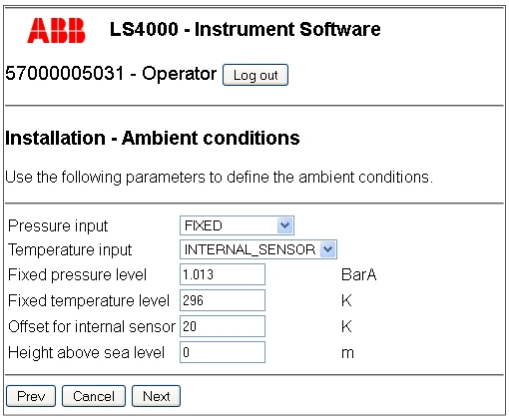
Enter physical properties of the flanges

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  Total flange path length
Concentration in flanges	Enter the purging gas concentration in the flanges (proportion of the measurement component in vol.-%) When using compressed air: Enter 20.9 %, when using nitrogen: Enter 0 %.
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

Name	Meaning/function
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
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation – Ambient conditions menu



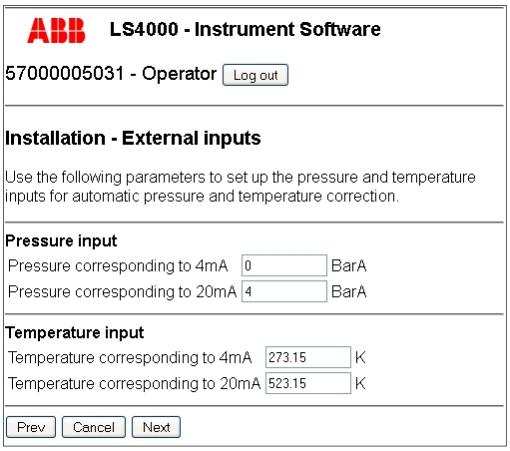
Intended use

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 – External inputs menu



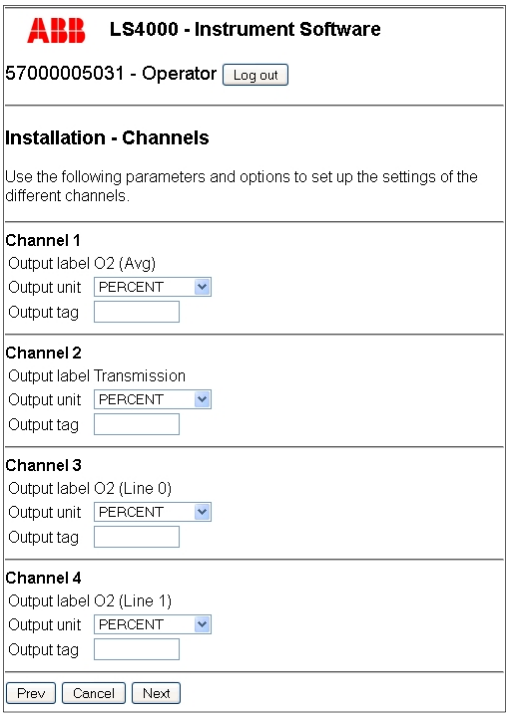
Intended use

Configure the measuring inputs

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Pressure 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
Temperature 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
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation – Channels menu



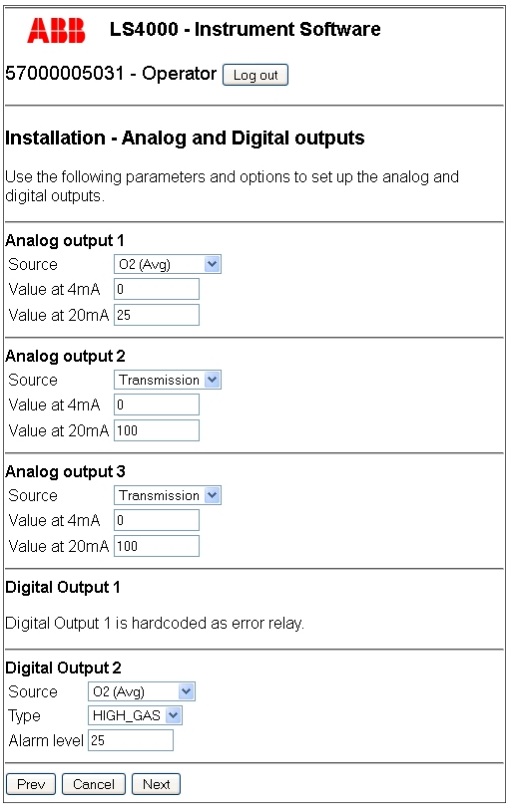
Intended use

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	O2 (Avg) description of measuring channel 1
Output unit	Select the unit for the value at output 1
Output tag	Not used
Channel 2	Measuring channel 2
Output label	Transmission description of measuring channel 2
Output unit	Select the unit for the value at output 2
Output tag	Not used
Channel 3	Measuring channel 3
Output label	O2 (Line 0) description of measuring channel 3
Output unit	Select the unit for the value at output 3
Output tag	Not used
Channel 4	Measuring channel 4
Output label	O2 (Line 1) description of measuring channel 4
Output unit	Select the unit for the value at output 4
Output tag	Not used
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Installation – Analog and digital outputs menu



Intended use

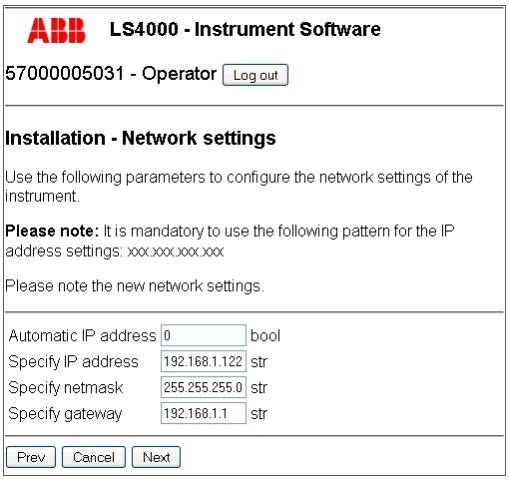
Configure analog and digital outputs

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: O2 (Avg)
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: Transmission
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: O2 (Avg)
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

Installation – Network settings menu



Intended use

Configure the network

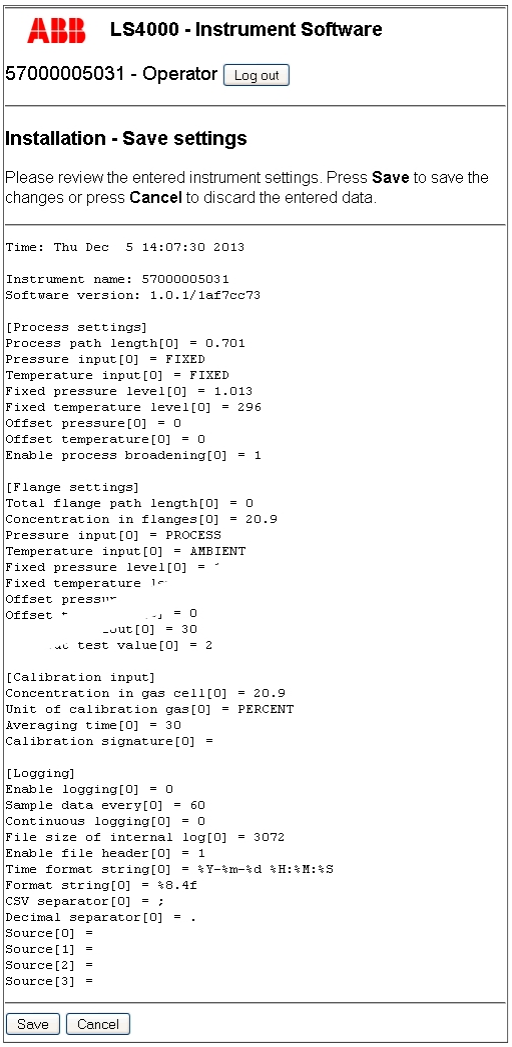
Description

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 IP address The factory-set IP address is provided in the analyzer data sheet.
Specify netmask	Enter the netmask
Specify gateway	Enter the gateway
Prev	Back to previous menu
Cancel	Cancel the process and exit the menu
Next	Continue to the next menu

Analyzer restart

A restart of the analyzer is necessary after changing the IP address. Go through the configuration routine until the end and save the entries. Power off the analyzer and power it on again. Then the analyzer can be reached at the new IP address.

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 …	List all entries and settings made in the configuration routine for checking
Save	Save entries and settings. End configuration routine. Back to Main menu
Cancel	Discard entries and settings. End configuration routine. Back to Main menu

Analyzer restart

When the IP address has been changed during the configuration routine, power off the analyzer and power it on again. Then the analyzer can be reached at the new IP address.

Maintaining and servicing the gas analyzer

Time schedule

Continuous

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 4 mA and 20 mA	this means that the optical transmission is sufficient.

As required

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 flange(s)
- Validation cell

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 for process 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 regular dirt:
  Commercially available washing-up liquid, diluted with distilled water.
- For heavy contamination:
  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.**

ATEX, IECEx and KCs variants: Checking the cable glands on the transmitter and receiver units

Proceed as follows:

Step	Procedure
1	Check that the cables are sitting firmly in the cable glands. If they are loose, correct as follows:
2	Tighten the fastening nuts by hand until the seal touches the cable.
3	Tighten the fastening nuts with one rotation of a spanner.
4	For safety reasons, shorten the inspection interval.

Validation

If ...	then ...
the analyzer has not detected any measurement gas for a long time	the analyzer must be checked to ensure it is able to detect measurement gas.

Proceed as follows:

Step	Procedure
1	Perform validation as described in section Validation on page 190.

Annual

Testing the analyzer

Proceed as follows:

Step	Procedure
1	Perform a full check of the analyzer as described in section Checking and approving for use on page 153.

Calibration

Proceed as follows:

Step	Procedure
1	Perform a calibration as described in section Calibration on page 193.

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 instrument software.

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

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Connecting the devices

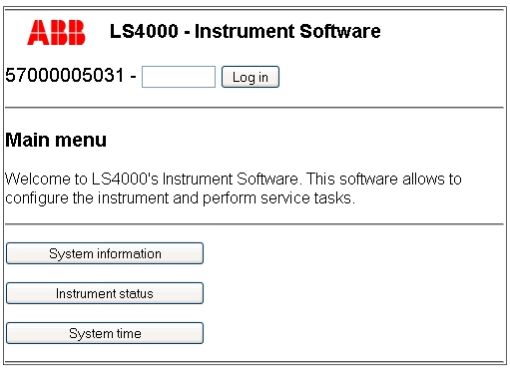
Step	Procedure
1	Ensure that transmitter unit and receiver unit are connected to the junction box and ready for operation.
2	Ensure that a PC is connected to the junction box.

Starting the instrument software

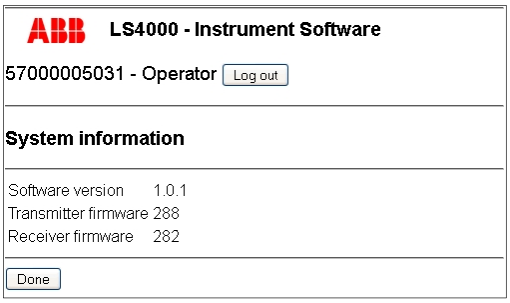
To start the instrument software, you need the IP address of the analyzer. The factory-set IP address is provided on the analyzer data sheet.

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



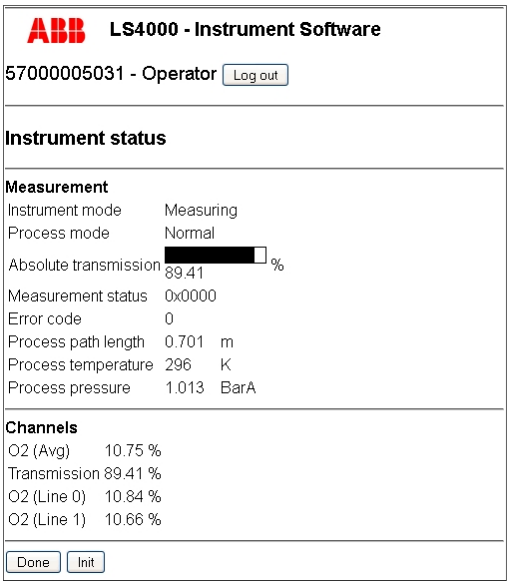
Intended use

View system information

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Software version	View the software version of the instrument software
Transmitter firmware	View the firmware version of the transmitter unit
Receiver firmware	View the firmware version of the receiver unit
Done	Exit menu

Instrument status menu



Intended use

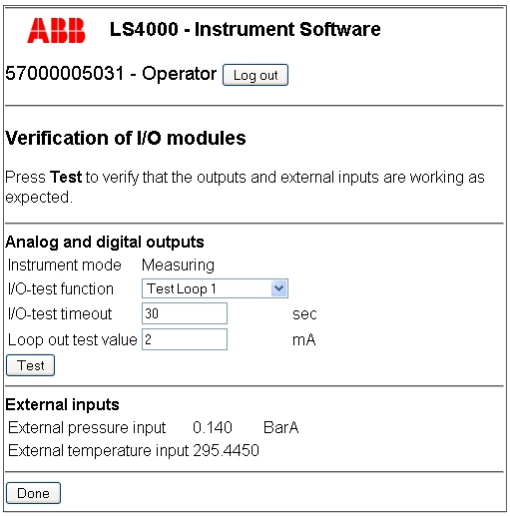
View operating status

View measurements

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Measurement	Measurements
Instrument mode	View operating status (Initialize, Measure, Fault, Service)
Process mode	View activity (Normal, Test, Calibration)
Absolute transmission	View measured transmission value
Measurement status	View the status of the measuring process (see Error Messages in "Measuring" mode on page 205)
Error code	View error code (see Error Messages in "Malfunction" status on page 206)
Process path length	View the length of the measuring section through the process
Process temperature	Read process gas temperature
Process pressure	Read process gas pressure
Channels	Measuring channels
O2 (Avg)	View the measured gas concentration (average)
Transmission	View the transmission value
O2 (Line 0)	View the measured gas concentration (Line 0)
O2 (Line 1)	View the measured gas concentration (Line 1)
Done	Exit menu
Init	Repeat the initialization of the gas analyzer

Verification of I/O modules menu



Intended use

Verify function of the inputs and outputs

Configure test run

Start test run

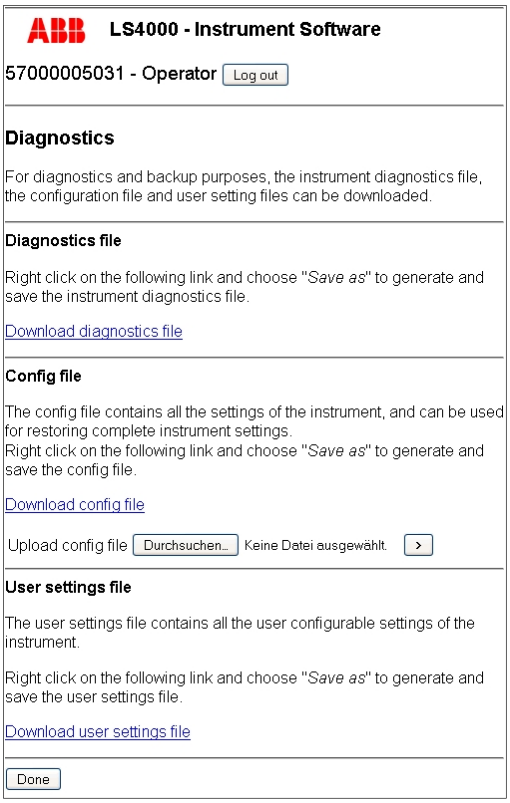
View test result

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	View operating status of the instruments
I/O-test function	Select test run Example: TEST RELAY 1 CLOSED
I/O-test timeout	Enter the duration of the test run
Loop out test value	Enter output value for test run
Test	Start test run
External inputs	External inputs
External pressure input	View a value for the pressure as defined in the menu Installation – External inputs on page 171
External temperature input	View a value for the temperature as defined in the menu Installation – External inputs on page 171
Done	Exit menu

Diagnostics menu



Intended use

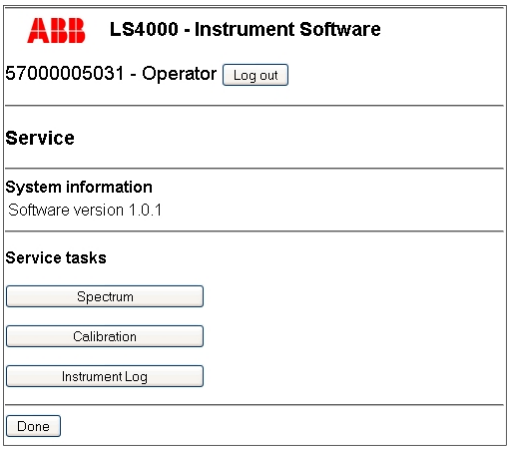
Download and save diagnostic results, configuration data and user settings from the analyzer

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



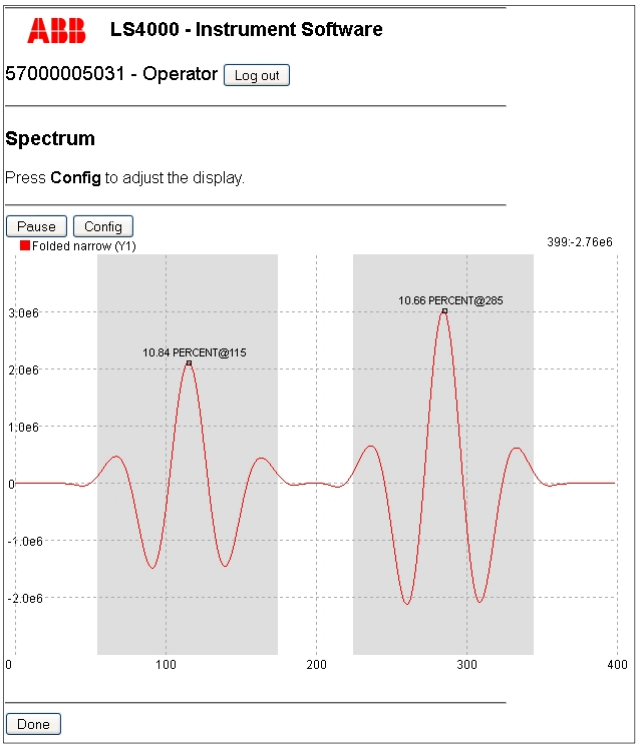
Intended use

Call up the service menus

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Spectrum	Call up Spectrum menu (see page 187)
Calibration	Call up Calibration Options menu (see page 201)
Instrument Log	Call up Logging menu (see page 188)
Done	Exit menu

Spectrum menu



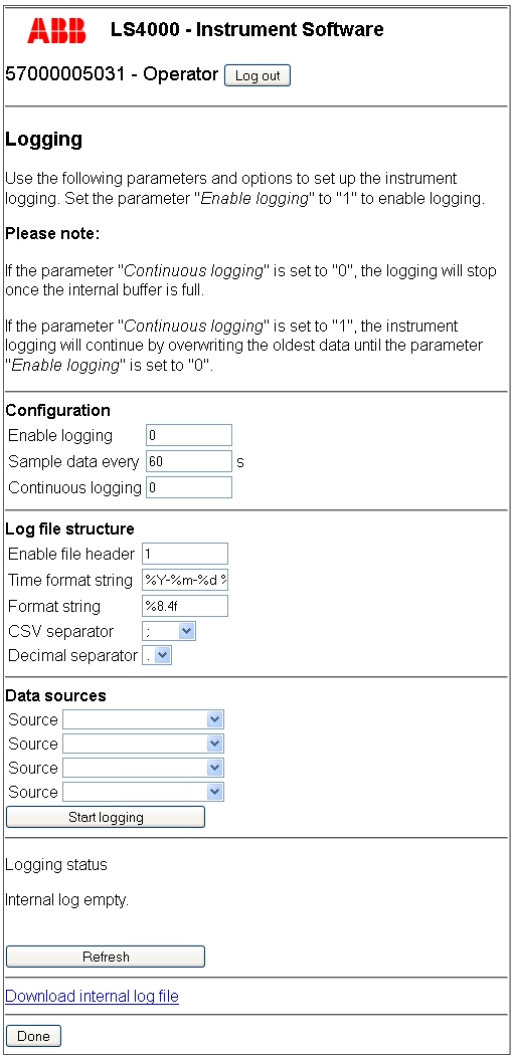
Intended use

View the spectrum

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Pause/Start	View the spectrum Pause: As a still image Start: 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
Enable logging	Measured value log 1: Activate or 0: Disable
Sample data every	Define the frequency of log file updates
Continuous logging	Continuously overwrite the log file 1: Activate or 0: Disable
Log file structure	Structure of the log file

Name	Meaning/function
Enable file header	Header 1: Activate or 2: Disable
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	Select four data sources for the entries in the log file
Source	Select the measuring channel
Source	Select the measuring channel
Source	Select the measuring channel
Source	Select the measuring channel
Start logging	Start the logging process
Logging status	Status of the measured value log
Internal log	Status of the measured value log
Refresh	Update the log file
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 cell is integrated in the process	the validation must be performed on a separate validation set.
a validation cell is integrated in the process	the validation can be performed on the process.

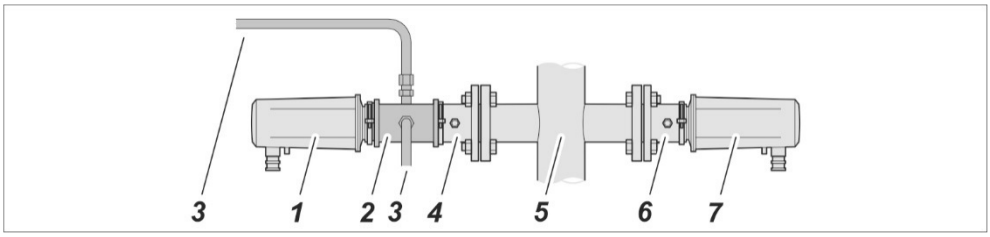
Separate validation set

The separate validation set is identical to the calibration set.

See section Installing the calibration set on page 193.

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

Test gas for validation

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

For the test gas, a gas mixture must be used that contains the measured component in a concentration suited to generating a significant change in the display of measured value (typically approx. 80 % of the upper range value, for approximate values refer to the following tables).

Validation cell with 60 mm length

MR	0 to 1 vol. %		0 to 10 vol. %		0 to 25 vol. %	
OPL	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}
1 m	14.6	0.8	100.0	5.5	100.0	5.5
5 m	73.1	0.8	100.0	1.1	100.0	1.1
10 m	100.0	0.5	100.0	0.5	100.0	0.5
15 m	100.0	0.4	100.0	0.4	100.0	0.4
20 m	100.0	0.3	100.0	0.3	100.0	0.3

Validation cell with 100 mm length

MR	0 to 1 vol. %		0 to 10 vol. %		0 to 25 vol. %	
OPL	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}
1 m	8.5	0.8	84.4	8.0	100.0	9.5
5 m	42.2	0.8	100.0	1.9	100.0	1.9
10 m	84.4	0.8	100.0	0.9	100.0	0.9
15 m	100.0	0.6	100.0	0.6	100.0	0.6
20 m	100.0	0.5	100.0	0.5	100.0	0.5

Two validation cells with 160 mm length

MR	0 to 1 vol. %		0 to 10 vol. %		0 to 25 vol. %	
OPL	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}	$c_{test\ gas}$	c_{total}
1 m	5.2	0.8	51.7	8.0	100.0	15.5
5 m	25.9	0.8	100.0	3.1	100.0	3.1
10 m	51.7	0.8	100.0	1.5	100.0	1.5
15 m	77.5	0.8	100.0	1.0	100.0	1.0
20 m	100.0	0.8	100.0	0.8	100.0	0.8

MR Measuring range

OPL Optical path length

$c_{test\ gas}$ Concentration of the test gas to be emitted for validation in vol. %

c_{total} Ensuing total concentration in the process in vol. %

Validation

Validation

Proceed as follows:

Step	Procedure
1	Allow the test gas to flow through the validation cell (flow rate approx. 1 l/min).
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 expert.

Step	Procedure
3	In the measuring operation, depending on the application, allow nitrogen or a mixture of nitrogen and the measuring component to flow through the validation cell (flow rate approximately 2 to 3 l/h).

Calibrating the gas analyzer

Installing the calibration set

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Calibration gas

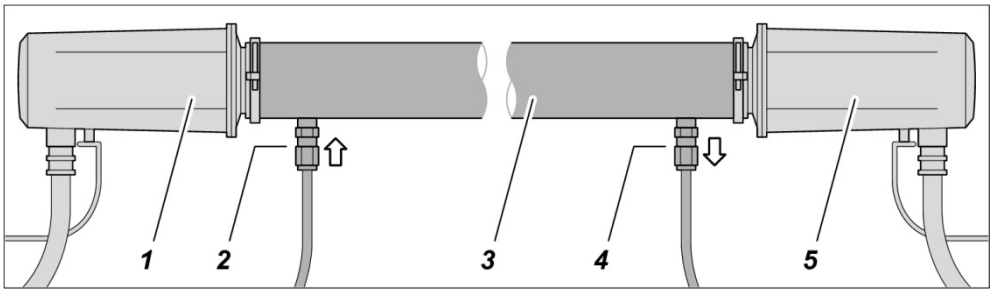
For the calibration gas, a gas mixture that contains the measured component in the same concentration as in the process gas must be used. The pressure and temperature must correspond to the ambient conditions.

The flow rate of the calibration gas must be set to approx. 1 l/min.

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

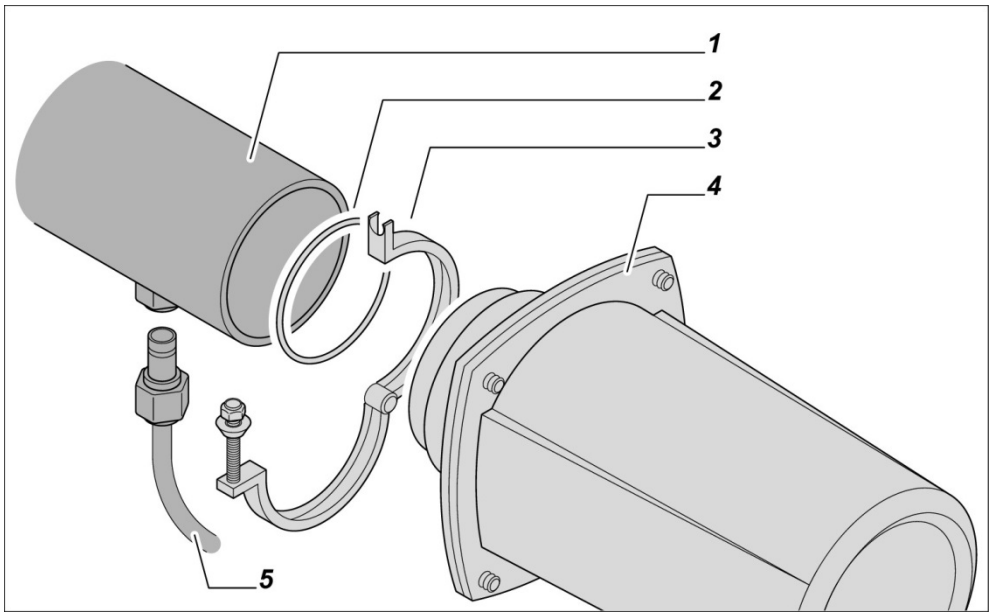
Preparing the calibration set

⚠ **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.

Step	Procedure
1	Disconnect the analyzer from the supply voltage.
2	Disassemble the transmitter unit and the receiver unit from the process. Ensure 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 a discharge line to the calibration gas output.
3	Connect the calibration gas to the calibration gas input.
4	Open the junction box.
5	Connect a PC to the junction box (see section Connecting the PC to the junction box on page 157).

The calibration set is now ready for the calibration process.

Adjusting the configuration

Preliminary remarks

The calibration is performed using the instrument software.

Open the instrument software

Proceed as follows:

Step	Procedure
1	Start up the PC.
2	Open a web browser.
3	Enter 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 "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.

Proceed as follows:

Step	Procedure
1	Click on "Installation". The "Installation procedure" menu is displayed.
2	Click on "Next" to start the installation wizard. The "Installation – Process Parameters" menu is displayed.

Installation – Process Parameters menu

Make the following settings:

Process path length	0.7 m
Pressure input	FIXED
Temperature input	FIXED
Fixed pressure level	Enter value of the ambient pressure
Fixed temperature level	Enter value of the ambient temperature
Enable process broadening	No

Step	Procedure
3	Leave the other settings unchanged.
4	Click on "Next". The "Installation – Installation Flanges" menu is displayed.

Installation – Installation Flanges menu

Make the following settings:

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

Step	Procedure
5	Leave the other settings unchanged.
6	Click on "Next". The "Installation – Ambient conditions" menu is displayed.

Installation – Ambient conditions menu

Step	Procedure
7	Leave all values unchanged.
8	Click on "Next". The "Installation – External inputs" menu is displayed.

Installation – External inputs menu

Step	Procedure
9	Leave all values unchanged.
10	Click on "Next". The "Installation – Channels" menu is displayed.

Installation – Channels menu

Step	Procedure
11	Leave all values unchanged.
12	Click on "Next". The "Installation – Analog and Digital outputs" menu is displayed.

Installation – Analog and Digital outputs menu

Step	Procedure
13	Leave all values unchanged.
14	Click on "Next". The "Installation – Network settings" menu is displayed.

Installation – Network settings menu

Step	Procedure
15	Leave all values unchanged.
16	Click on "Next". The "Installation – Save settings" menu is displayed.

Installation – Save settings menu

Step	Procedure
17	Check all the settings.

If ...	then ...
a setting is incorrect	the procedure 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 procedure.
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 is displayed.
2	Click on "Calibration". The "Calibration options" menu is displayed (see page 201).
3	Click on "Start user calibration". The "Calibration settings" menu is displayed (see page 202).

Entering calibration data

Step	Procedure
4	Determine the value to be entered in the "Concentration in gas cell" field as follows:

If ...	then ...
the calibration is performed with instrument air	enter "20.9".
the concentration of the calibration gas is known	enter the concentration of the calibration gas.

Make the following settings:

Concentration in gas cell	(the value determined in step 4)
Unit of calibration gas	Unit in which the calibration gas concentration is to be displayed
Averaging time	Measuring duration for determining the average value (typically 30 s, max. 60 s.)
Calibration signature	User name (this entry is optional)

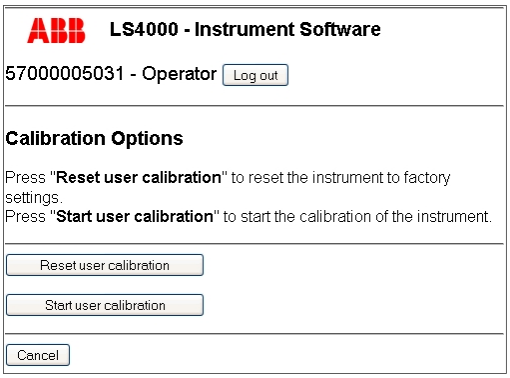
Step	Procedure
5	Click on "Next". The "Calibration" menu is displayed (see page 203).

Calibration

Step	Procedure
6	Allow the calibration gas to flow through the calibration cell (flow rate approx. 1 l/min).
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.

Step	Procedure
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.

Calibration options menu



Intended use

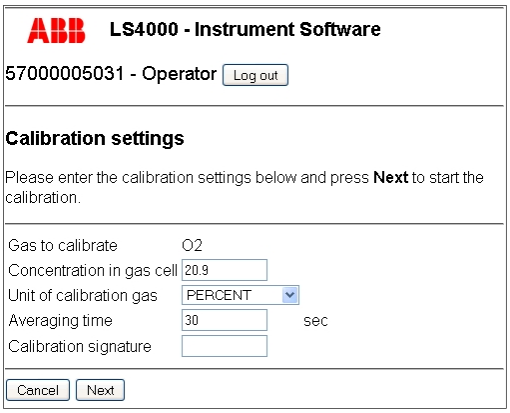
Start calibration

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 Calibration settings menu
Cancel	Exit menu

Calibration settings menu



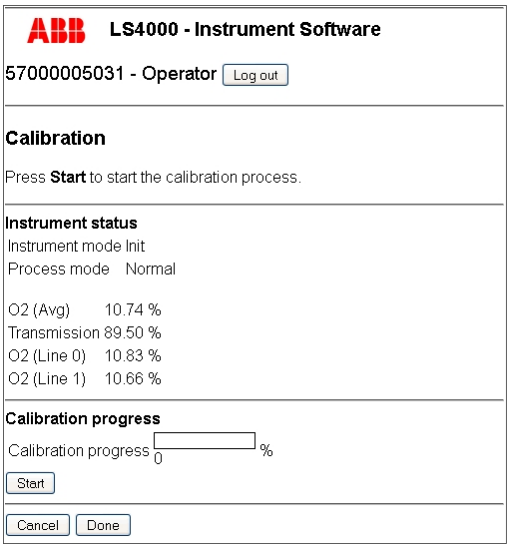
Intended use

Enter parameters for the calibration process

Description

Name	Meaning/function
Log out	Log out and return to the main menu
Gas to calibrate	View measured component
Concentration in gas cell	Enter the calibration gas concentration in the calibration cell
Unit of calibration gas	Define 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
Cancel	Exit menu
Next	Call up Calibration menu

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 mode	View operating status
Process mode	View activity During calibration, the following is displayed: "Test gas N2 balance"
O2 (Avg)	View the calibration gas concentration (average)
Transmission	View the transmission value
O2 (Line 0)	View calibration gas concentration (Line 0)
O2 (Line 1)	View calibration gas concentration (Line 1)
Calibration progress	
Calibration progress	Track progress of the calibration process
Start	Start calibration process
Cancel	Cancel the calibration process
Done	Exit menu Return to the main 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 to the process (see Installing the transmitter unit and receiver unit on page 76). New seals and new self-locking nuts must be used for installing on the process.
2	Check the analyzer in accordance with the checklists in section "Checking and approving for use on page 153".
3	Re-connect the analyzer to the supply voltage.

Restoring the configuration

Proceed as follows:

Step	Procedure
1	Use the Installation Wizard to restore the original configuration (see Adjusting the configuration on page 196). Note for the explosion proof variants of the analyzer: Set the date and time (see section System time menu on page 161).
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
0x040	TIMING_ERROR The analyzer is overloaded.	▪ Reduce the measurement period for determining the average value
All others	Unknown or cannot be resolved on your own	▪ Inform authorized service personnel of the error code

Error messages in "Malfunction" status

"Malfunction" status

The analyzer goes into “malfunction” status if an error has been detected during the initialization of the analyzer. It can take up to five minutes until the analyzer changes to “malfunction” status because the analyzer goes through the initialization routine several times.

The analyzer goes into “malfunction” status if an error occurs in "measuring" mode and subsequently an initialization has been started.

The analyzer can exit the “malfunction” status only if the error has been resolved (see table below) and is not present anymore 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 interrupted.	▪ 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 instrument software.
10	SETTING IS CORRUPTED The analyzer is not configured correctly.	▪ Correct the configuration of the analyzer using the instrument 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 instrument 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 interrupted.	▪ 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 interrupted.	▪ 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 instrument 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 instrument 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 interrupted.	▪ Check and repair the electrical connection between the transmitter unit and receiver unit

Error code	Meaning and cause	How to resolve the error

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.

37	INVALID PT INPUT Error in connecting the T/P probe	▪ Check and repair the electrical connections of the T/P probe to the junction box. ▪ Check the signal of the T/P probe. ▪ Check the configuration of the device in the instrument software.
All others	Unknown or cannot be resolved on your own	▪ Inform authorized service personnel of the error code

Shutting down the gas analyzer

Stopping use and shutting down the gas analyzer

Ensuring safety

No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

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.

Disassembly

Ensuring safety

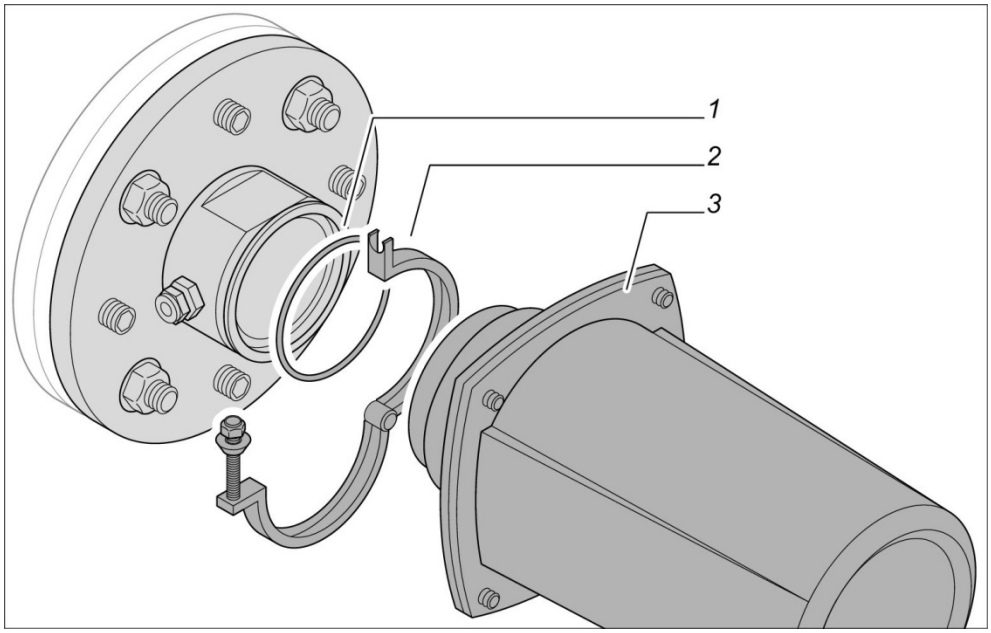
No explosion protection is present when performing this work!

⚠ **Risk of explosion.**

Make sure that no explosive gases or dusts are present when performing this work.

Disassembling the transmitter unit and receiver unit

Before uninstalling, shut down the analyzer (see Stopping use and shutting down the gas analyzer on page 209). 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 and the receiver unit firmly.
2	Loosen and remove the clip from the transmitter or receiver unit.
3	Remove the transmitter or receiver unit from the purging flange.
4	Remove the purging flange flat gasket from the groove of the purging flange.
5	Disassemble the purging flanges and close the installation flange openings.

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