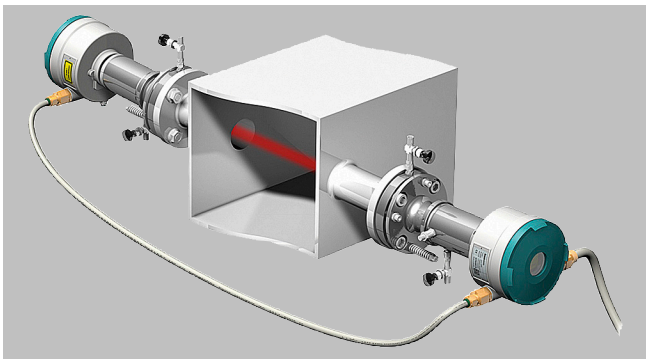
Overview



SITRANS SL is a diode laser gas analyzer with a measuring principle based on the specific light absorption of different gas components. SITRANS SL is suitable for fast, non-contact measurement of gas concentrations in process or flue gases. An analyzer consisting of transmitter and detector units (sensors) is used for each measuring point. The hardware for further processing of the measured signal into a concentration value, as well as the monitoring, control and communication functions, are integrated in these two main modules. The sensors are designed for operation under harsh environmental conditions.

Benefits

The in situ SITRANS SL gas analyzer features high operational availability, unique analytical selectivity, and a wide range of possible applications. SITRANS SL permits measurement of a gas component directly in the process:

- With high dust load
- In hot, humid, corrosive, explosive, or toxic gases
- In applications showing strongly varying gas compositions
- Under harsh ambient conditions at the measuring point
- Highly selective, i.e. mostly without cross-sensitivities

Special features of the SITRANS SL:

- Low installation workload
- Minimum maintenance requirements
- Extremely rugged design
- High long-term stability through built-in, maintenance-free reference gas cell
- Real-time measurements

Moreover, the device provides warning and error messages in the following situations:

- When maintenance is required
  - With large variations in the reference signal
  - With poor signal quality
- If the transmission violates a minimum or maximum value

Application

Applications

- Control of combustion processes
- Process optimization
- Plant and operator safety
- Process measurements in all types of power and combustion plants
- Process control
- Explosion protection
- Measurements in corrosive and toxic gases
- Quality control

Sectors

- Chemical and petrochemical plants
- Power plants
- Waste incinerators
- Iron and steel industry

Design

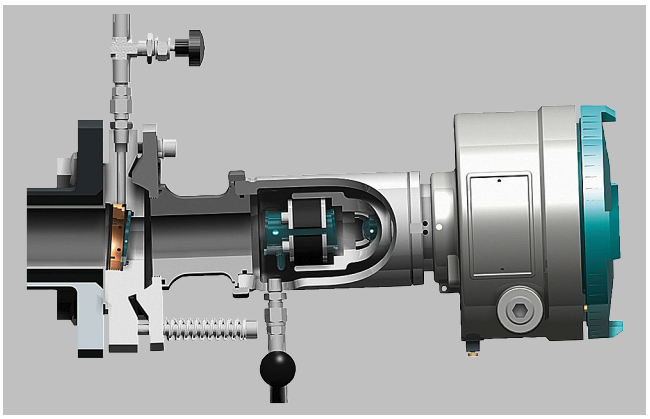
The SITRANS SL gas analyzer consists of a pair of cross-duct sensors, a transmitter unit and a detector unit, both with identical mechanical dimensions. The complete analyzer is integrated in these two enclosures. The transmitter unit contains the laser source whose light is transmitted to the detector through the measurement path. The detector unit contains a photodetector including detector electronics as well as a reference cell. The detector unit is connected to the transmitter unit by means of a sensor connecting cable. A further connecting cable on the detector is used to connect the power supply and the communications interfaces. The detector enclosure contains a local user interface (LUI) with an LC display which can be read through a window in the enclosure cover. The local user interface is operated by remote control.

Transmitter and detector units

Special features of the transmitter and detector units:

- In situ cross-duct sensors, designed as transmitter and detector units, connected via sensor connecting cable
- Powder-coated aluminum; stainless steel
- Degree of protection IP65
- Adjustable process connection plates
- Flange sizes (provided by customer): DN50/PN25, DN50/PN40, ANSI 4"/150 lbs
- Purging gas connections (see Purging)
- Optional: Explosion-protected version in accordance with
  - Ex II 2G Ex db e op is IIC T6 Gb
    Ex II 2D Ex tb IIIC T 85°C Db
  - FM USA:
    XP Class I Div 1 Groups A, B, C, D T6 Ta = 55°C
    DIP Class II,III Div 1 Groups E, F, G T6 Ta = 55°C
    Class I, Zn 1, AEx db IIC T6 Gb Ta = 55°C
    Zn 21, AEx tb IIIC T85°C Ta = 55°C
  - FM Canada:
    XP Class I Div 1 Groups C, D T6 Ta = 55°C
    DIP Class II,III Div 1 Groups E, F, G T6 Ta = 55°C
    Class I, Zn 1, Ex db IIC T6 Ta = 55°C
    Zn 21, Ex tb IIIC T85°C Db Ta = 55°C
  - NEPSI Ex:
    Ex d e op is IIC T6 Gb
    Ex tD A21 IP65 T85°C
  - TIIS Japan:
    Ex db II C T6 Gb

Design (continued)



SITRANS SL, detector unit

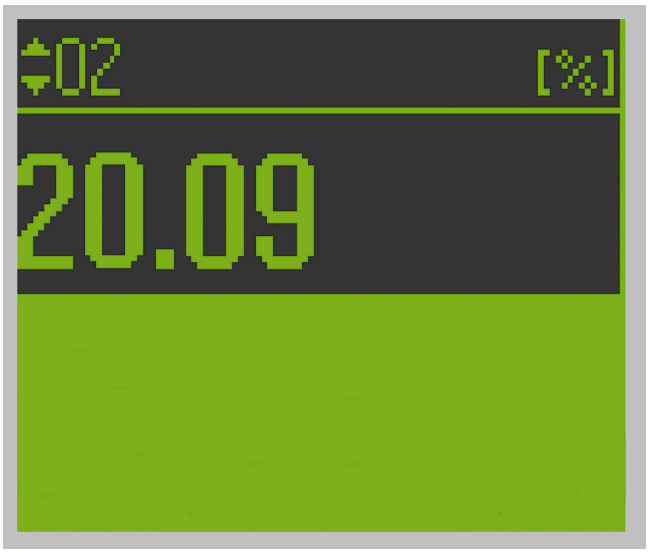
Parts in contact with the process gas

Only the stainless steel flange of the sensor with borosilicate window and FFKM gasket comes in contact with the process gas. This has optional purging gas connections for purging the process gas side with an appropriate gaseous medium.

Display and operator panel

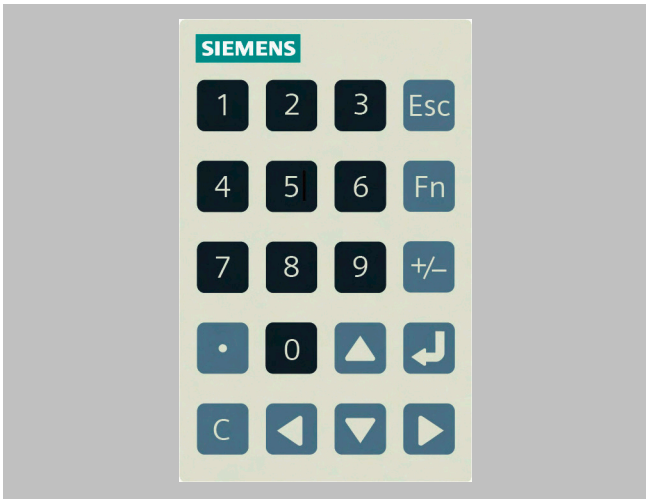
Special features of the detector unit:

- Display for simultaneous output of measurement result and device status
- LED backlighting of display
- Remote control with infrared interface for simplified parameterization and operation for safe implementation in hazardous zones
- Menu-driven operation for parameterization and diagnostics



Local user interface (LUI) of SITRANS SL in the detector unit (display of measured value)

Design (continued)



Remote control keypad for SITRANS SL

Connection cables

SITRANS SL is supplied as standard without connection cables. These must be provided by the customer or are available as accessories. Exception: The standard ATEX version is supplied with pre-installed cabling.

The sensor connecting cable connects the transmitter and detector units of the analyzer.

The sensor connecting cable is offered as a cable set for the ATEX version as standard, and for non-Ex applications as an option, in lengths of 5, 10 and 25 m. This (optional) cable set also enables permanent installation of an Ethernet cable used for service and maintenance purposes.

A rugged cable sleeve should be used as UV protection for installations in open cable ducts or channel systems.

The statutory directives must be observed in the event of installation in hazardous areas.

For the ATEX version of SITRANS SL, the sensor connecting cable must be connected between the two Ex-e junction boxes secured on the transmitter and detector units.

Inputs/outputs

- 2 analog inputs (4 to 20 mA) for process gas temperature and pressure
- 2 analog outputs (4 to 20 mA) for gas concentration or for concentration and transmission
- 1 configurable digital input
- 2 configurable digital outputs (display of errors, maintenance required, function monitoring, alarms for upper limit violations of measured value or transmission)
- 1 Ethernet 10Base-TX port, only for servicing and maintenance

Optional

1 Modbus interface with

- Output of concentration as cyclic data
- Alarm output, alarm classification
- Input for temperature and/or pressure data for compensation

1 PROFIBUS-DP interface with

- Output of concentration as cyclic data

Design (continued)

- Alarm output, alarm classification
- Input for temperature and/or pressure data for compensation

The PROFIBUS DP protocol provides DPV0, cyclic data. Measured values are provided with additional quality data.

Note:

In contrast to the other interfaces, the Ethernet plug-in connector on standard non-Ex devices is only accessible following removal of the enclosure cover of the detector unit. With the help of the sensor cable set (optional with non-Ex devices), an Ethernet cable can be permanently installed via the junction box of the sensor connecting cable. The Ethernet connection via the sensor connecting cable can also only be used for temporary service and maintenance purposes.

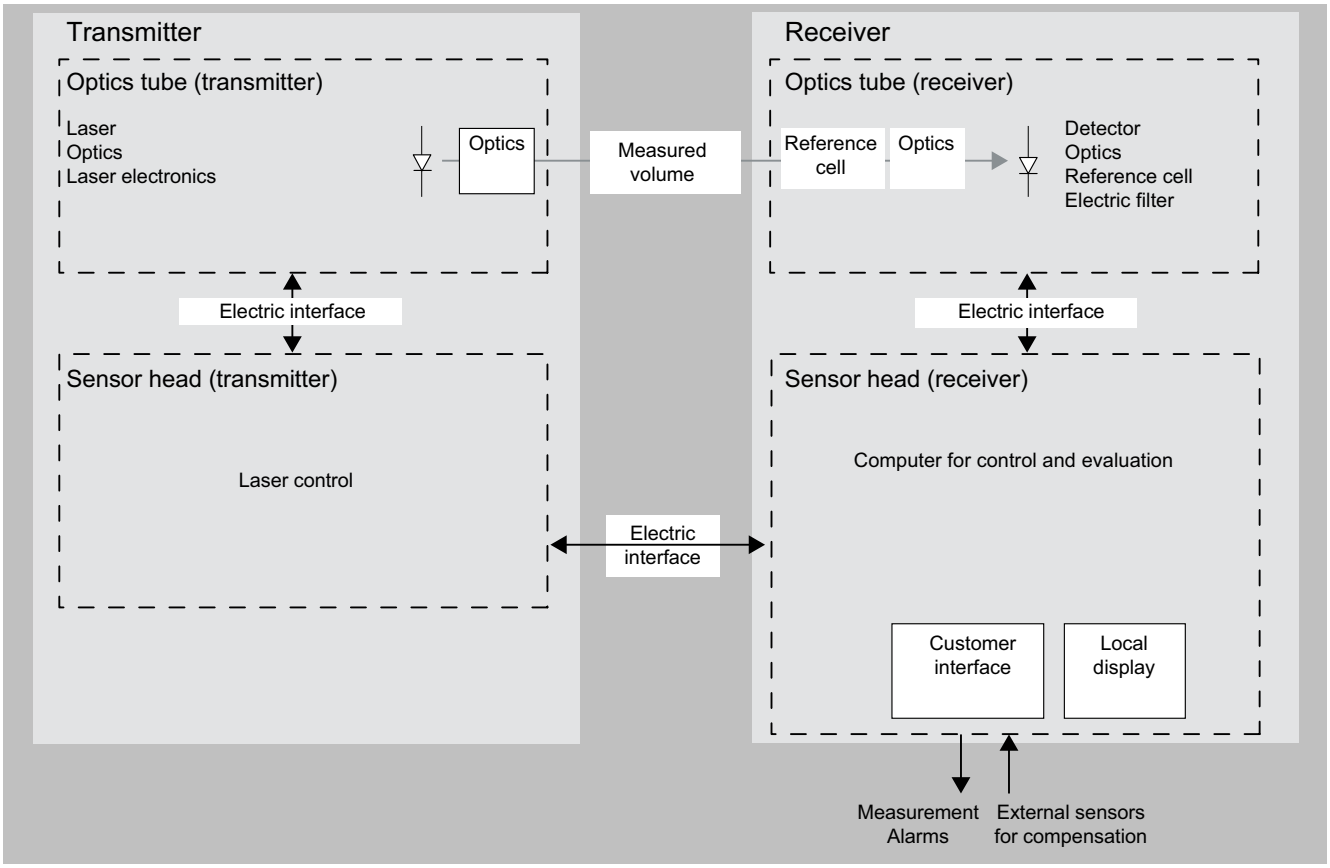
CAUTION:

In an Ex environment, Ethernet connections may only be made or removed with the permission of the plant operator!

Function

Operating principle

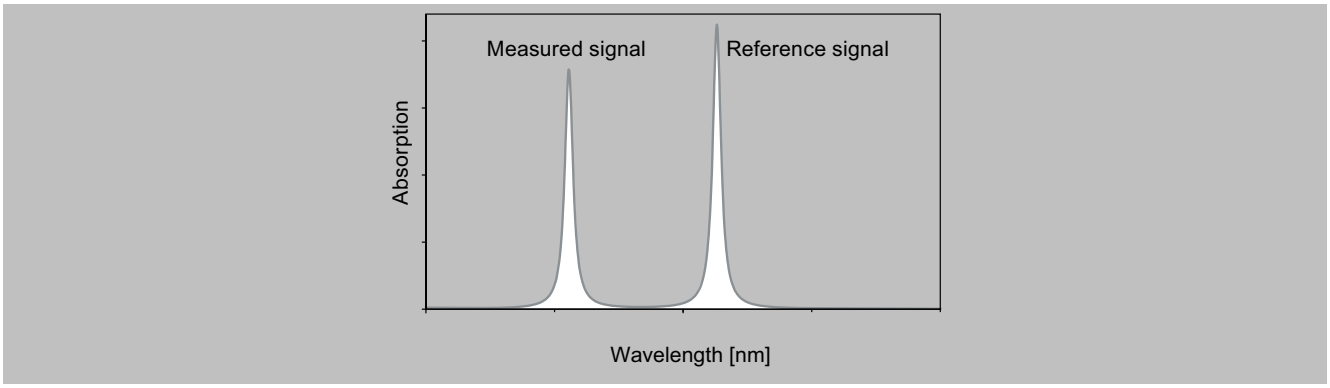
SITRANS SL is a gas analyzer employing single-line molecular absorption spectroscopy. A diode laser emits a beam of infrared light which passes through the process gas and is received by a detector unit. The wavelength of the laser diode output is tuned to a gas-specific absorption line. The laser continuously scans this single absorption line with a very high spectral resolution. The degree of absorption and the line shape are used for the evaluation.



Basic design of the SITRANS SL

The field device design of the SITRANS SL in situ gas analyzer consists of a transmitter unit and a detector unit. The light which is not absorbed by the sample is measured in the detector unit. The concentration of the gas component is determined from the absorption.

The SITRANS SL analyzer measures a single gas component by means of the absorption capacity of a single fully resolved molecular absorption line.



Absorption spectrum of measured signal and reference signal with SITRANS SL

Function (continued)

SITRANS SL is designed for measuring oxygen (O_2) with high sensitivity.

Typical application specifications	
Oxygen concentration	0 ... 100 vol%
Process pressure/temperature conditions	700 ... 5 000 hPa (absolute)/0 ... 200 °C 900 ... 1 100 hPa (absolute)/0 ... 600 °C

The measuring performance of the SITRANS SL depends, for example, on the actual, individual process conditions with regard to concentration ranges, pressure and temperature.

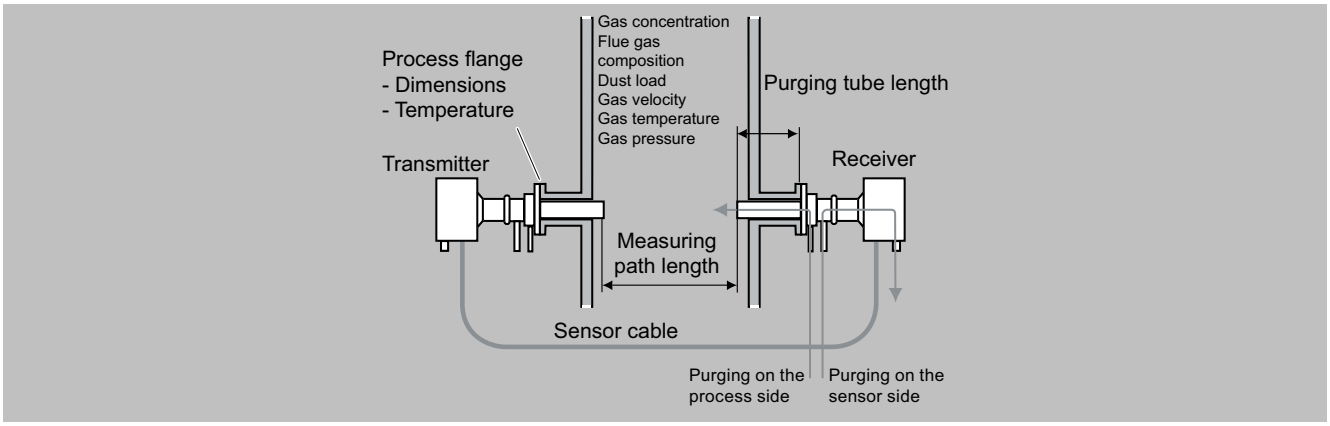
An internal reference cell is used to constantly check the stability of the spectrometer.

The self-calibration of the analyzer is therefore valid for one year without the need for external re-calibration using calibration gases.

Configuration

A feature of the in situ analytical procedure is that the physical measurement takes place directly in the process gas stream and directly in the actual process gas line. All process parameters such as gas matrix, pressure, temperature, moisture, dust load, flow velocity and mounting orientation can influence the measuring properties of the SITRANS SL and must therefore be investigated for each new application.

The standard applications listed in the ordering data for the SITRANS SL are distinguished in that the typical process conditions are adequately well-known and documented. If you cannot find your application among the standard applications, please contact Siemens. We will be pleased to check your possible individual application of the SITRANS SL. You can find an application questionnaire on the SITRANS SL product page on the internet: http://www.siemens.com/insituquestionnaire



Typical cross-duct arrangement of the SITRANS SL

The SITRANS SL can be optionally purged on the process side using appropriate purging gases to prevent contamination of the sensor optics on the process side. Purging tubes on the sensor heads, which slightly extend into the process gas stream, define the effective measuring path length.

Influences on the measurement

Dust load

As long as the laser beam is able to generate a suitable detector signal, the dust load in the process gas does not influence the analytical result. By applying a dynamic background correction, measurements can be carried out without any negative impact. Under optimal conditions, the SITRANS SL can cope with dust loads up to 20 g/Nm³ and up to a measured path length of 8 m. The influence of a high dust load is extremely complex, and depends on the optical path length and particle size. The optical damping increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical damping. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Temperature

The influence of temperature on the absorption line is compensated by a correction file. A temperature signal can be fed into the device from an external temperature sensor. The signal is then used for mathematical correction of the influence of the temperature on the concentration strength. If the process gas temperature remains constant, a static correction can be carried out as an alternative. Without temperature compensation, the relative error caused by changes in the gas temperature has an extensive effect on the measurement (e.g. up to 0.24%/K with the O_2 application). An external temperature signal is therefore recommended in most cases.

Pressure

In addition to the temperature signal, an external pressure signal can be fed to the device to provide complete mathematical compensation for the pressure influence including the density effect. Without compensation, the relative measuring error caused by changes in the process gas pressure is approx. 0.1%/hPa. An external pressure signal is therefore recommended in most cases.

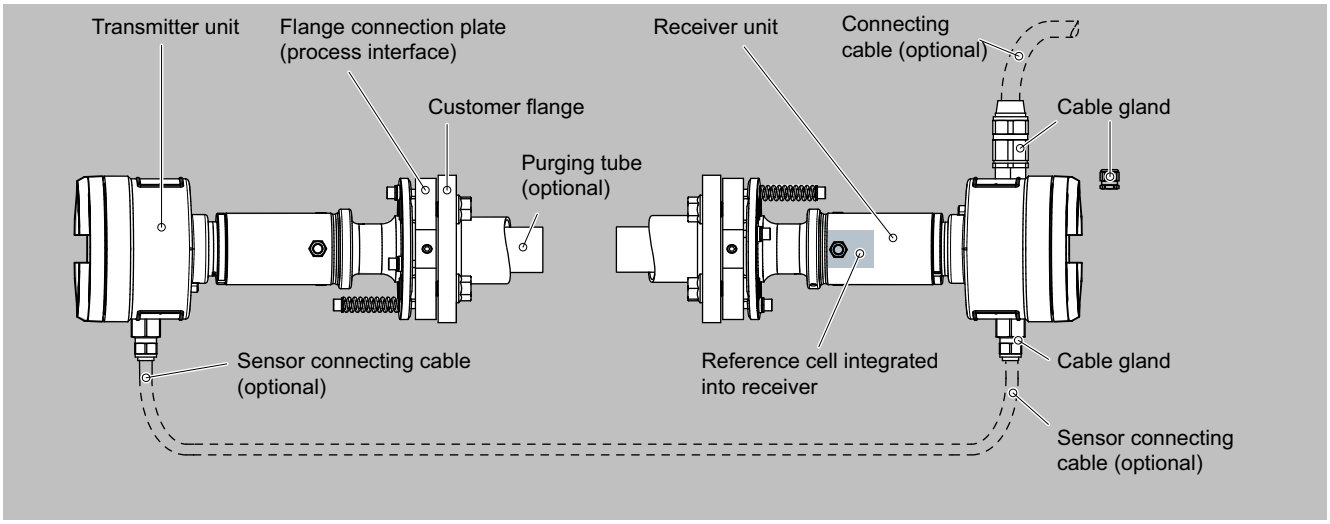
Effective optical path length

As a result of Beer-Lambert's law, the absorption of laser light depends on the optical path length within the sample gas. Therefore the precision of the effective optical path length measurement can have an effect on the precision of the total measurement.

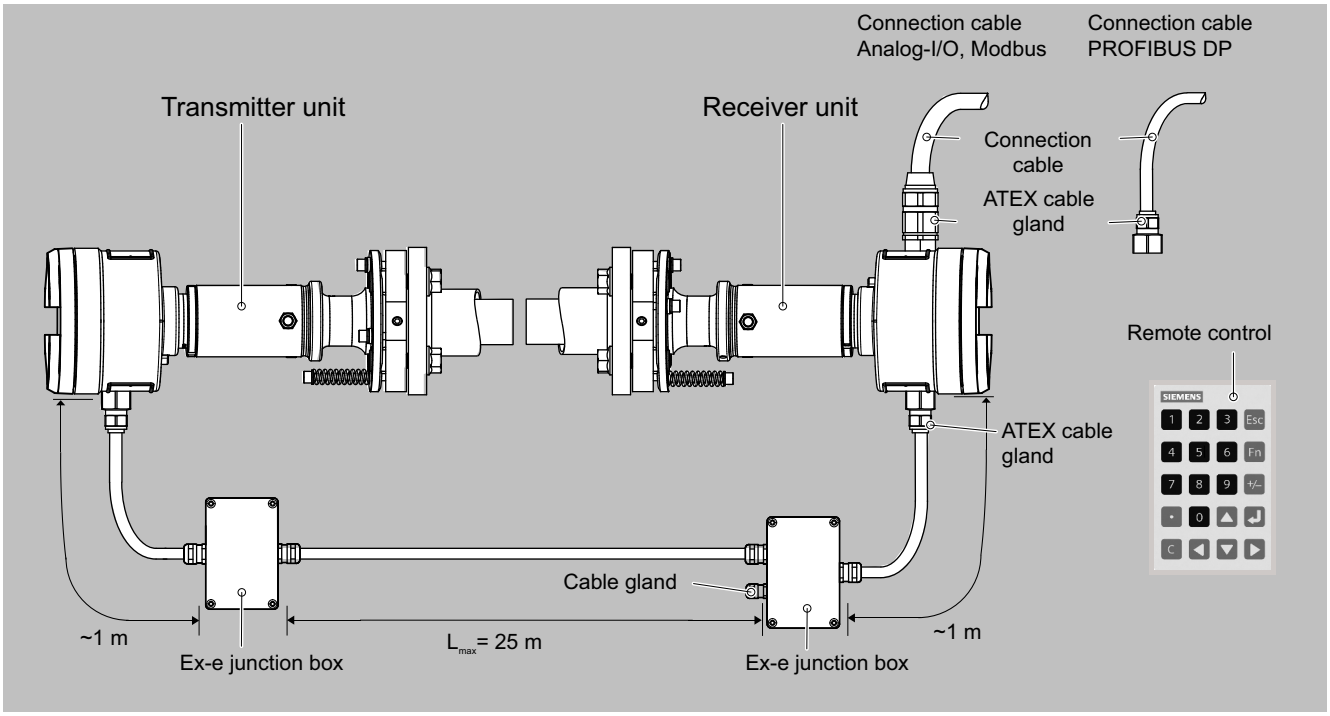
Since the sensor optics on the process side usually have to be purged to keep them clean for a longer period, the expansion of the mixed zone between the purging medium and the process gas as well as the latter's concentration distribution must be considered. In a typical in situ installation with an optical path length of several meters, the influence of the purging gas on the effective path length can be ignored.

The maximum possible path length and dust load mutually affect each other: the higher the dust load in the process, the shorter the max. possible path length.

Function (continued)

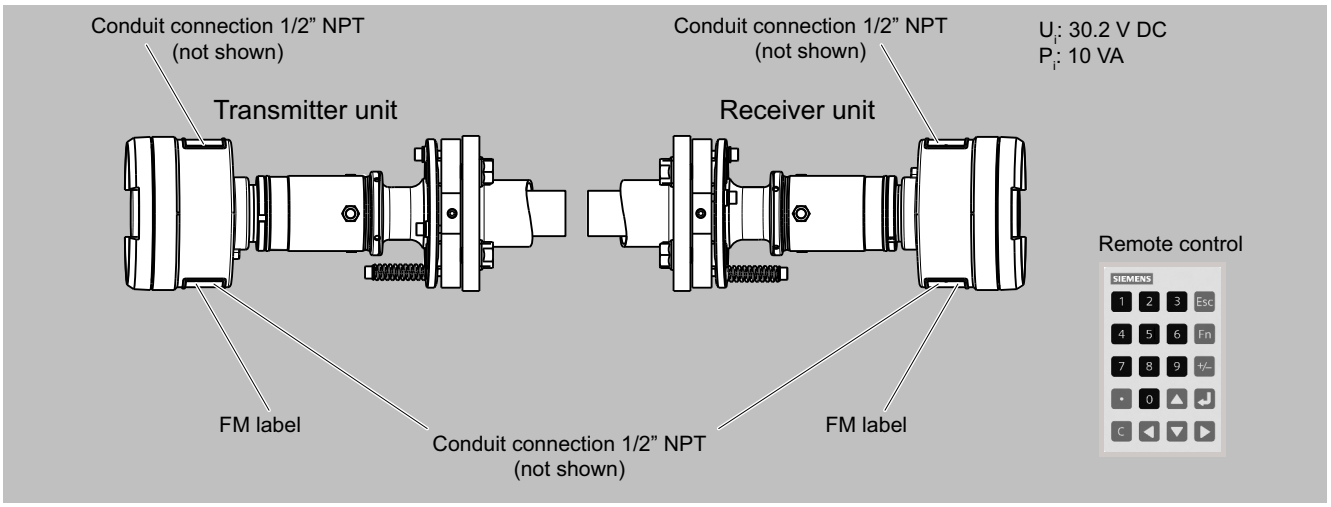


Design of the SITRANS SL system in non-Ex version



Design of the SITRANS SL system in ATEX version

Function (continued)

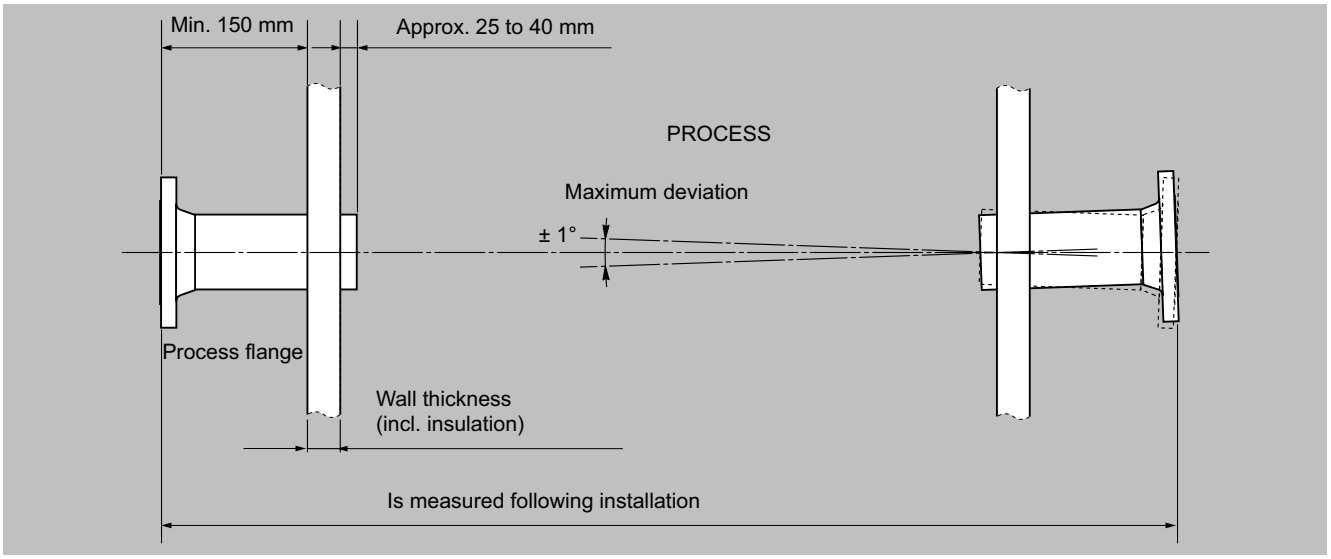


Design of the SITRANS SL system in FM version

The transmitter and detector units are mounted on process flanges provided by the customer. Correct alignment of these flanges must be guaranteed, e.g. by using the optional sensor alignment kit.

Adjustment of the pair of sensors

The flange connection plates (process interface) of the SITRANS SL to the process flanges on the customer side must be correctly aligned so that the laser beam generated by the transmitter hits the photo detector in the detector unit. This is ensured by the transmitter and detector units having a curved surface integrated in the connection plates. The adjustment is carried out by shifting the flanges on these surfaces, through which the symmetry axis is aligned. The axis can be offset by ± 1 degree, which means that the process flanges must be welded onto the process wall with at least this accuracy - see following figure.



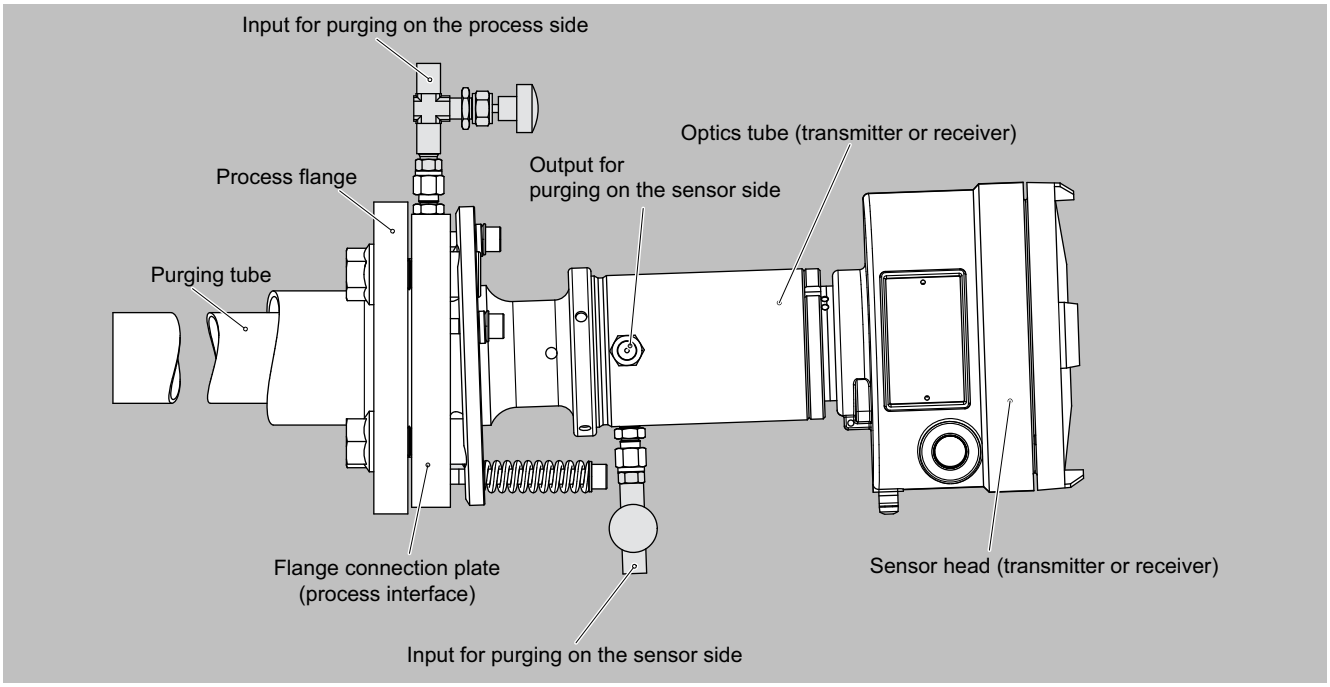
Installation/adjustment requirements for the pair of cross-duct sensors

Purging

The easiest way to avoid condensation and dust deposits on the sensor windows or excessively high thermal stress of the windows and the gasket material as well as the sensor electronics is to purge them with a purging gas (with O_2 application: nitrogen). Purging must be selected depending on the application. The cross-duct sensors can therefore be configured for the respective situation. The application reference table provides recommendations for suitable purging for the standard applications.

If oxygen is to be measured with the SITRANS SL - which is also present in measurable quantities in the ambient air - oxygen-free purging gases must be used, such as nitrogen. It is equally necessary to purge the inside of the sensor heads, since the ambient air must also be displaced here out of the laser beam path. A differentiation is therefore made between purging on the process side and purging on the sensor side.

Function (continued)



Arrangement for purging on the sensor side of the SITRANS SL

Purging on process side

For purging on the process side, the purging gas flow can be adjusted between 0 and approx. 50 l/min at each sensor head using a needle valve (included in scope of delivery).

Purging on sensor side

This can be combined with the purging on the process side, if required. Purging with nitrogen on the sensor side is almost always necessary for O_2 applications to avoid an offset caused by the oxygen of the air present in the device. The cells in the sensor head are then continuously purged with nitrogen. Particularly when (re)starting the SITRANS SL O_2, a sufficiently high flow of sensor purging gas of approx. 3 to 5 l/min must be provided for several minutes to ensure that all residues of oxygen are removed. The flow of sensor purging gas can subsequently be set to a lower value using the needle valve (included in scope of delivery).

Note

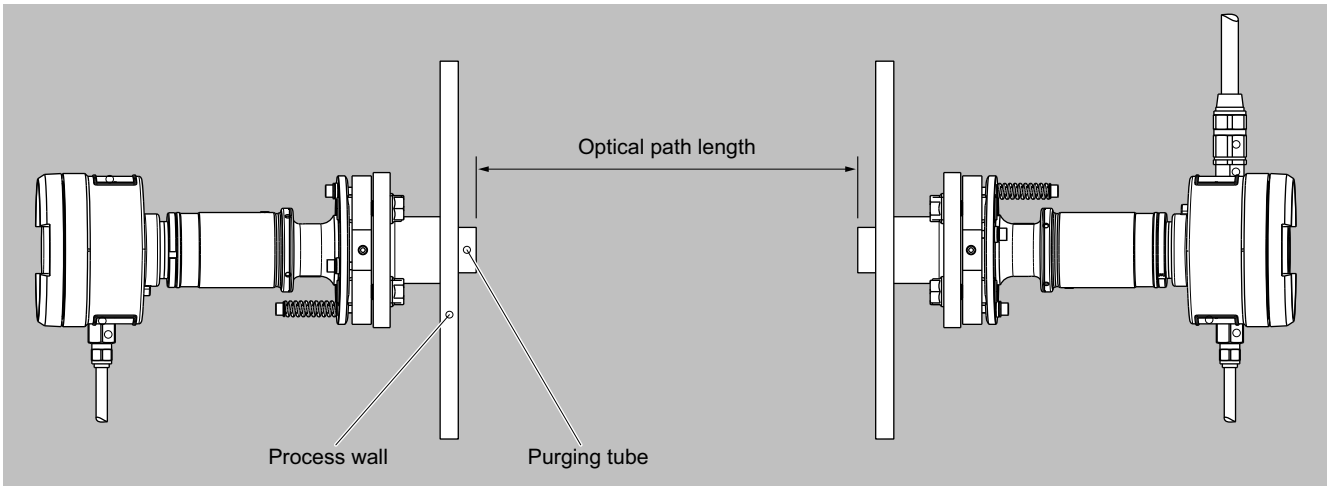
No process gas may flow into the purging gas line!

With purging on the process side, it may be necessary to use non-return valves to ensure no process gas can enter the purging gas line in the event of failure of the purging gas supply. Otherwise, there is a risk of zone entrainment (explosion protection). This applies especially in the case of cascaded process and sensor purging to prevent corrosive process gases from entering the optics enclosure.

Purging tubes

The purging media used on the process side flow through purging tubes into the process gas stream. The pipes extend into the process area by a few centimeters, usually perpendicular to the process gas stream. This means that an exactly defined optical path length is defined through the sample gas. The effective measuring path in the process gas is therefore defined as the distance between the ends of the two purging tubes. The standard length of the purging tubes is 340 mm. To achieve sufficient calibration of the transmitter and detector, the process wall should be max. 150 mm thick.

Function (continued)



Measurement of the optical path length between the ends of the purging gas tubes

Maintenance and fault messages

The SITRANS SL carries out continuous self-monitoring, and outputs alarms and warnings to indicate maintenance required or a system fault. The information is output as plain text on the LUI display, where symbols identify the category and the severity of the fault.

Alarm categories:

- Maintenance (system must be cleaned or repaired)
- Process value (problem with external sensor, or process conditions outside the permissible range for SITRANS SL)
- Configuration (SITRANS SL is not correctly configured)

Severity:

- Error (measurements could not be carried out)
- Warning (measurements may be inaccurate, or the system will soon shut down measuring mode if an intervention is not made)
- Advanced warning/information (measurements are carried out)

The two binary (relay) outputs can be configured freely for the alarm output.

The response of the analog outputs in the event of an alarm is configurable; possible actions are:

- Off (current measured value is displayed)
- Last measured value (freezing of last value displayed)
- Standard level (setting to predefined value)
- 3 mA (NAMUR NE43 error status)

In addition, the transmission is available as an output variable.

Note

Specific requirements for the measuring point can make the utilization of special sensor equipment necessary. The possibilities for adapting the sensors are:

- Special materials for purging tubes (on request)
- Various types/sizes of sensor flanges
- Explosion-protected sensor configurations

Essential characteristics

- Long-term stabilization by using an internal reference cell; for calibration interval of at least one year
- Dynamic background correction for varying dust loads
- Isolated signal outputs of 4 to 20 mA
- User-friendly, menu-driven operation
- Selectable time constants (response time)
- Password-protected user interface
- I/O operation in accordance with NAMUR recommendations
- Monitoring of overall optical signal transmission
- Sensor enclosure resistant to wear and corrosion
- Simple local operation using remote control unit with numeric keypad and menu prompting

Standard applications

The following table lists the measuring conditions for standard applications. The listed values for the measuring range and detection limit are only approximate values. The exact values at the respective measuring point depend on the totality of all influencing parameters and can be determined by Siemens for the specific case. Note that the values for the detection limit and the maximum measuring range are based on a path length of 1 m. Longer path lengths will improve the detection limit, but not linearly. This is due to limiting effects such as dust load. The maximum applicable measuring ranges can only be used if permitted by the process conditions (e.g. dust load).

Function (continued)

Standard application Effective optical path length: 0.3 … 8 m Dust load[2]: < 50 g/Nm³			Process gas temperature T_{min} … T_{max}	Process gas pressure p_{min} …p_{max}	Min. measuring range (with 1 m eff. opt. path length)	Max. measuring range (also dependent on eff. opt. path length: see following column below)
Sample gas component	**Gas code**	**Appl. code**				
O_2	A	B	0 … 600 °C	900 … 1 100 hPa	0 … 1 vol%	0 … 100 vol%
O_2	A	C	0 … 200 °C	700 … 5 000 hPa	0 … 1 vol%	0 … 100 vol%

Standard application Effective optical path length: 0.3 … 8 m Dust load[2]: < 50 g/Nm³			Max. measuring range x path length	DL x path length (under standard conditions[1] without cross-interference of other gases)	Repeatability[3]	Purging gas medium
Sample gas component	**Gas code**	**Appl. code**				
O_2	A	B	75 vol%*m	200 ppmv*m	2% [4]	N_2
O_2	A	C	75 vol%*m	200 ppmv*m	2% [4]	N_2

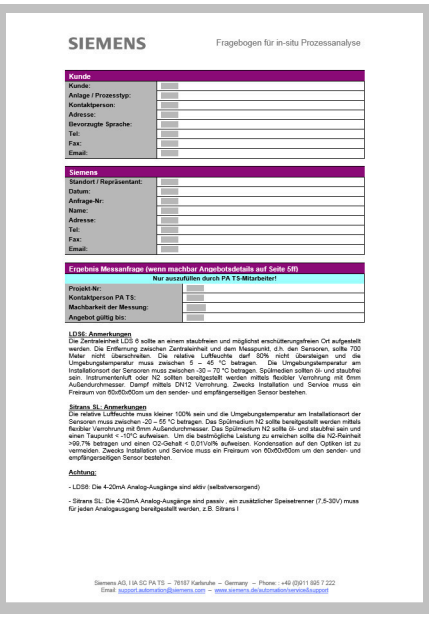
Reference table: Standard applications. The specified pressures are absolute.
DL = detection limit

1) The specification provided applies at 20 °C and 1013 hPa in a nitrogen atmosphere. In rare cases, a deviating process gas matrix or process conditions can have a negative effect on performance. Contact Siemens to determine the exact performance under your process conditions.
2) With 0.3 m effective optical path length
Average diameter of the dust particles: 15 µm
Specific weight of the dust particles: 650 kg/m³
The influence of dust load is extremely complex and depends on the path length and particle size. The optical damping increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical damping. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.
3) Based on measuring range. With stable or externally measured and software-compensated process gas temperature and pressure conditions.
4) 2% of measured value or DL (whichever is greater).

Special applications

In addition to the standard applications, special applications are available on request. If the process conditions deviate from the specifications of the standard applications, special applications are also possible on request.

Complete the application questionnaire which can be found on the internet at http://www.siemens.com/insituquestionnaire:


SIEMENS

Fragebogen für in-situ Prozessanalyse

Kunde:	
Kunde:	
Anlage / Prozesstyp:	
Kontaktperson:	
Adresse:	
Bevorzugte Sprache:	
Tel:	
Fax:	
Email:	

Siemens	
Standort / Repräsentant:	
Datum:	
Anfrage-Nr:	
Name:	
Adresse:	
Tel:	
Fax:	
Email:	

Ergebnis Messanfrage (wenn machbar Angebotsdetails auf Seite 5ff)	
Nur auszufüllen durch PA TS-Mitarbeiter!	
Projekt-Nr:	
Kontaktperson PA TS:	
Machbarkeit der Messung:	
Angebot gültig bis:	

LDS6: Anmerkungen
Die Zentraleinheit LDS 6 sollte an einem staubfreien und möglichst erschütterungsfreien Ort aufgestellt werden. Die Entfernung zwischen Zentraleinheit und dem Messpunkt, d.h. den Sensoren, sollte 700 Meter nicht überschreiten. Die relative Luftfeuchte darf 90% nicht übersteigen und die Umgebungstemperatur muss zwischen 5 – 45 °C betragen. Die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -30 – 70 °C betragen. Spülmedien sollten öl- und staubfrei sein. Instrumentenluft oder N2 sollten bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Dampf mittels DN12 Verrohrung. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den sender- und empfängerseitigen Sensor bestehen.

Sitrans SL: Anmerkungen
Die relative Luftfeuchte muss kleiner 100% sein und die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -20 – 55 °C betragen. Das Spülmedium N2 sollte bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Das Spülmedium N2 sollte öl- und staubfrei sein und einen Taupunkt < -10°C aufweisen. Um die bestmögliche Leistung zu erreichen sollte die N2-Reinheit >99.7% betragen und einen O2-Gehalt < 0,01Vol% aufweisen. Kondensation auf den Optiken ist zu vermeiden. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den senden- und empfängerseitigen Sensor bestehen.

Achtung:

- LDS6: Die 4-20mA Analog-Ausgänge sind aktiv (selbstversorgend)

- Sitrans SL: Die 4-20mA Analog-Ausgänge sind passiv , ein zusätzlicher Speisetrenner (7,5-30V) muss für jeden Analogausgang bereitgestellt werden, z.B. Sitrans I.

Siemens AG, I IA SC PA TS – 76187 Karlsruhe, – Germany – Phone: +49 (0)911 895 7 222
Email: support.automation@siemens.com – www.siemens.de/automation/service&support

Selection and ordering data

SITRANS SL in situ gas analyzer		Article No. 7MB6221-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Explosion protection[1]												
Without			0									
Ex II 2 G Ex db e op is IIC T6 Gb Ex II 2 D Ex tb IIIC T85°C Db			1									
FM USA:			2									
Class I, Division 1, Groups A, B, C, D; T6 Ta = 55°C Class II/III, Division 1, Groups E, F, G, T6 Ta = 55°C Class I, Zone 1, AEx db IIC T6 Gb Ta = 55°C Zone 21, AEx tb IIIC T85°C Db Ta = 55°												
FM Canada:												
Class I, Division 1, Groups C, D; T6 Ta = 55°C Class II/III, Division 1, Groups E, F, G, T6 Ta = 55°C Class I, Zone 1 Ex db IIC T6 Gb Ta = 55°C Zone 21, Ex tb IIIC T85°C Db Ta = 55°C												
Measured component												
O_2				A								
Application examples[2]												
Control of combustion processes					B							
Process control, safety monitoring in appropriate plant concepts					C							
Communications interface												
2x analog I/O, 1x DI, 2x DO						0						
PROFIBUS DP						1						
Modbus						2						
Purging tubes, material	**Length**											
No purging tubes							0					
Stainless steel	340 mm						1					
Purging: Process side	**Purging: Sensor side**											
No purging	No purging								0			
No purging	3 ... 5 l/min								1			
0 ... 50 l/min	No purging								2			
0 ... 50 l/min	3 ... 5 l/min								3			
Process connection [3]												
Stainless steel flange (1.4404/316L), connection dimensions ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 232 psi										B		
Stainless steel flange (1.4404/316L), connection dimension DN50/PN25, MAWP (PS) at 20 °C: 2.5 MPa										C		
Stainless steel flange (1.4404/316L), connection dimension DN50/PN40, MAWP (PS) at 20 °C: 4.0 MPa										E		
Without process connection										X		
Sensor cable												
With brass bushing												
• 5 m											A	
• 10 m											B	
• 25 m											C	
With stainless steel gland												
• 5 m											D	
• 10 m											E	
• 25 m											F	
Without cable											X	
Language of the operating software (preset)												
German												0
English												1
French												2
Spanish												3
Italian												4

1) Complete and consistent implementation of the safety concept by the plant operator must be ensured during the commissioning and operation of the in situ SITRANS SL laser spectrometer in hazardous atmospheres.
2) The examples shown represent possible applications where appropriately configured SITRANS SL solutions can be used. The user is responsible for the prevailing conditions (plant concept, possibly redundant, application of appropriate components required in addition, compliance with possible directives, etc.).
3) MAWP: Maximum Allowable Working Pressure.

Selection and ordering data (continued)

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Inspection certificate 3.1 (leak test) in accordance with EN 10204	***C12*** [1]
Inspection certificate 3.1 (material certificate) in accordance with EN 10204	***C13*** [1]
SIL 1 Declaration of Conformity in accordance with standards IEC 61508 / IEC 61511 (for the measured component oxygen in combination with analog interfaces)	***C20*** [1]
Surface free of copper and silicone	***R01***
Special application	***R10 ... R39***
Tag plate, customized inscription	***Y30***
Additional label Special application	***Y31***
Hardware change	***Y33***

[1] In combination with explosion protection according to FM on request

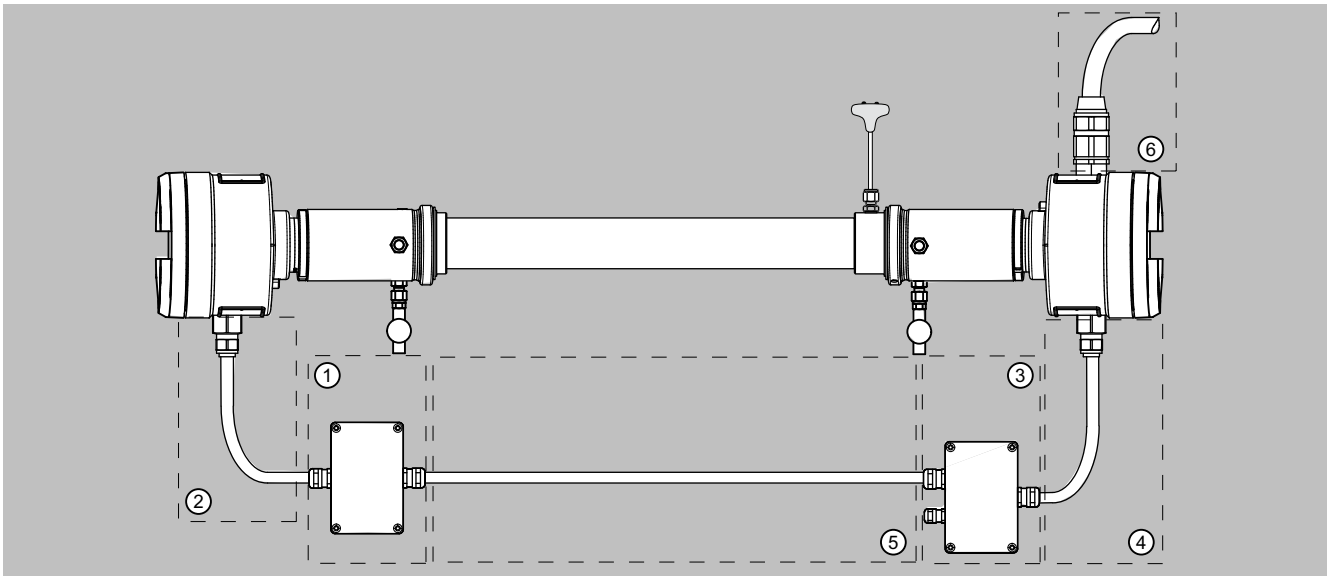
Additional units and spare parts	Article No.	Item No. (see graphic below)
Additional units		
SITRANS SL, calibration verification set O_2	**A5E01000694**	
SITRANS SL, sensor alignment kit	**A5E50918922**	
SITRANS SL, connection box Ex-e for 25-pin connecting cable	**A5E01267567**	
SITRANS SL, connecting cable set analog (for non-Ex)	**A5E03328474**	
SITRANS SL, connecting cable set PROFIBUS DP (for non-Ex)	**A5E03328473**	
SITRANS SL, UV protective hose for outdoor installation, ND = 48 mm per 30 m length	**A5E01714061**	
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 5 m	**A5E02509347**	**3+4+5**
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 10 m	**A5E02528048**	**3+4+5**
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 25 m	**A5E02528052**	**3+4+5**
Spare parts		
SITRANS SL, process connection plate (1 unit) for customer flange size: DN 50/PN 10 ... 40 including gasket	**A5E01009881**	
SITRANS SL, gasket for DN 50/PN 10 ... 40	**A5E02522036**	
SITRANS SL, process connection plate (1 unit) for customer flange size: ANSI 4"/150 lbs including gasket	**A5E01009883**	
SITRANS SL, gasket for ANSI 4"/150 lbs	**A5E02789535**	
SITRANS SL, purging tube 340 mm incl. gasket for DN 50/PN 10 ... 40	**A5E01009892**	

Additional units and spare parts	Article No.	Item No. (see graphic below)
SITRANS SL, window cover for detector unit	**A5E01009897**	
SITRANS SL, cover for transmitter unit	**A5E02568437**	
SITRANS SL, connecting cable for analog and Modbus (ATEX), cable gland of nickel-plated brass, for devices delivered after October 2009 (Version 1.1)	**A5E02608597**	**6**
SITRANS SL, connecting cable for analog and Modbus (ATEX), cable gland of stainless steel	**A5E34834297**	**6**
SITRANS SL, connecting cable for PROFIBUS DP (ATEX), cable gland of nickel-plated brass	**A5E02608594**	**6**
SITRANS SL, cable for transmitter (ATEX), cable gland of nickel-plated brass	**A5E44678580**	**2**
SITRANS SL, cable for detector (ATEX), cable gland of nickel-plated brass	**A5E44678567**	**4**
SITRANS SL, connecting cable for PROFIBUS DP (ATEX), cable gland of stainless steel	**A5E34834296**	**6**
SITRANS SL, connecting cable for transmitter (ATEX), cable gland of stainless steel	**A5E34830928**	**2**
SITRANS SL, connecting cable for detector (ATEX), cable gland of stainless steel	**A5E34831050**	**4**
SITRANS SL, terminal box and connecting cable for transmitter (ATEX), cable gland of stainless steel	**A5E34831075**	**1**
SITRANS SL, terminal box (ATEX), cable gland brass, nickel-plated	**A5E02091532**	**1**
SITRANS SL, terminal box and connecting cable for transmitter (ATEX), cable gland of nickel-plated brass	**A5E02568463**	**1+2**
SITRANS SL, sensor connecting cable 5 m	**A5E02571180**	**5**
SITRANS SL, sensor connecting cable 10 m	**A5E02571184**	**5**
SITRANS SL, sensor connecting cable 25 m	**A5E02571186**	**5**
SITRANS SL, terminal box and connecting cable for detector (ATEX), cable gland of stainless steel	**A5E34831078**	**3**
SITRANS SL, terminal box and connecting cable for detector (ATEX), cable gland of nickel-plated brass	**A5E02568465**	**3+4**
SITRANS SL, cable gland for non-Ex cables	**A5E02568457**	
SITRANS SL, union nut	**A5E01010033**	
SITRANS SL, printed circuit board for detector with LUI (Version 1.1)	**A5E31503119**	
SITRANS SL, remote control IS, CSA, FM, ATEX certifications	**A5E02091214**	
SITRANS SL, assembly kit for needle valve	**A5E02569944**	
SITRANS SL, assembly kit restrictor for sensor purging	**A5E02183375**	
SITRANS SL, flashlight with adapter	**A5E33259745**	

Other accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector: www.pia-portal.automation.siemens.com

Selection and ordering data (continued)



SITRANS SL replacement parts, item numbers

Accessories

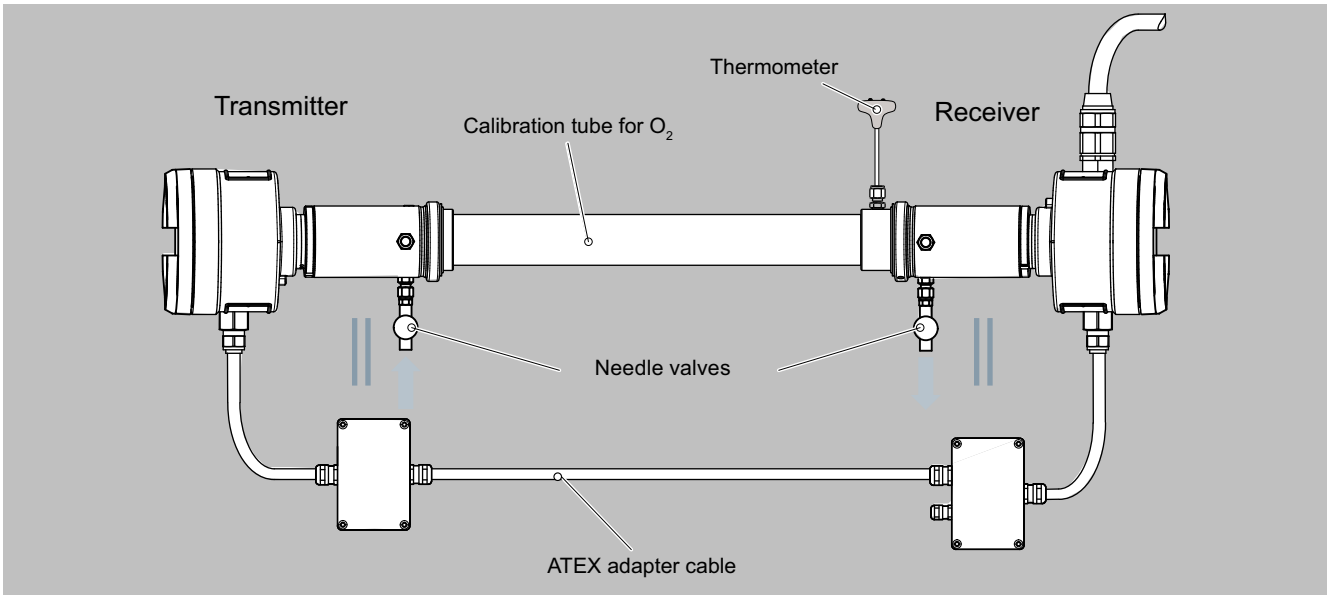
SITRANS SL sensor alignment kit

The SITRANS SL sensor alignment kit includes a battery-operated lamp, a centering aid with cross-hairs and two hook spanners for loosening the sensors from the flange connection plates.

Please note:
The SITRANS SL sensor alignment kit is not explosion-protected! Therefore it must never be used in a hazardous area without approval by the plant operator!

Calibration verification kit

The SITRANS SL has already been factory-calibrated. If it is desirable or necessary to check the calibration, this can be performed using an external calibration test kit following removal of the transmitter and detector units. This procedure has no influence on the optical adjustment of the device since the flange connection plates remain mounted on the customer flange. The calibration verification kit for O_2 consists of a stainless steel calibration tube and a thermometer. To carry out the calibration, it is mounted between the transmitter and detector. The calibration tube for O_2 can then be filled with air or a calibration gas.



Calibration validation setup of SITRANS SL O_2

Other accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector: www.pia-portal.automation.siemens.com

Technical specifications

In situ O2 gas analyzer	
Analytical performance	
Measuring range	Internally adjustable
Detection limit at standardized conditions: 25 °C gas temperature, 1 000 hPa, 1 m effective optical path length, 3 s integration time and constant ambient conditions.	O_2: 200 ppmv
Linearity (under standard conditions)	Better than 1%
Repeatability (under standard conditions)	O_2: 2% of measured value or DL (whichever is greater)
General information	
Design	Transmitter and detector units, connected by a sensor cable
Materials	• Sensor enclosure: Treated aluminum/stainless steel (1.4305/303) • Process interface: Acid-resistant stainless steel (1.4404/316L) • Window: hardened borosilicate glass • Compressible gaskets: FKM, FF, EPDM (holder for reference cell) • Flat gaskets: Graphite
Parts in contact with the process gas	• Purging tubes, flanges, window ring, process purging: Acid-resistant stainless steel (1.4404/316L) • Window: hardened borosilicate glass • Gasket in window: FFKM • Flat gasket between customer flange and process flange: Graphite
Installation	In situ or bypass
Concentration units	ppm, vol%, mg/Nm³
Display	Digital concentration display (4 digits with floating decimal point)
Laser protection class	Class 1, safe to the eye
Explosion protection	Optionally, according to • ATEX II 2G Ex db e op is IIC T6 Gb ATEX II 2D Ex tb IIIC T85 °C Db • FM USA: Class I, Division 1, Groups A, B, C, D; T6 Ta = 55°C Class II/III, Division 1, Groups E, F, G, T6 Ta = 55°C Class I, Zone 1, AEx db IIC T6 Gb Ta = 55°C Zone 21, AEx tb IIIC T85°C Db Ta = 55° • FM Canada: Class I, Division 1, Groups C, D; T6 Ta = 55°C Class II/III, Division 1, Groups E, F, G, T6 Ta = 55°C Class I, Zone 1 Ex db IIC T6 Gb Ta = 55°C Zone 21, Ex tb IIIC T85°C Db Ta = 55°C • NEPSI Ex: Ex d e op is IIC T6 Gb Ex tD A21 IP65 T85°C • TIIS Japan: Ex db II C T6 Gb
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Dimensions	For each unit (transmitter, detector) • Diameter: 165 mm • Length: 357 mm
Purging tube	• Length: 340 mm • Outer diameter: 48 mm • Inside diameter: 44 mm
Weights	
• Detector unit	6.0 kg
• Transmitter unit	5.2 kg
• Process interface	
- for DN50/PN25	5.3 kg

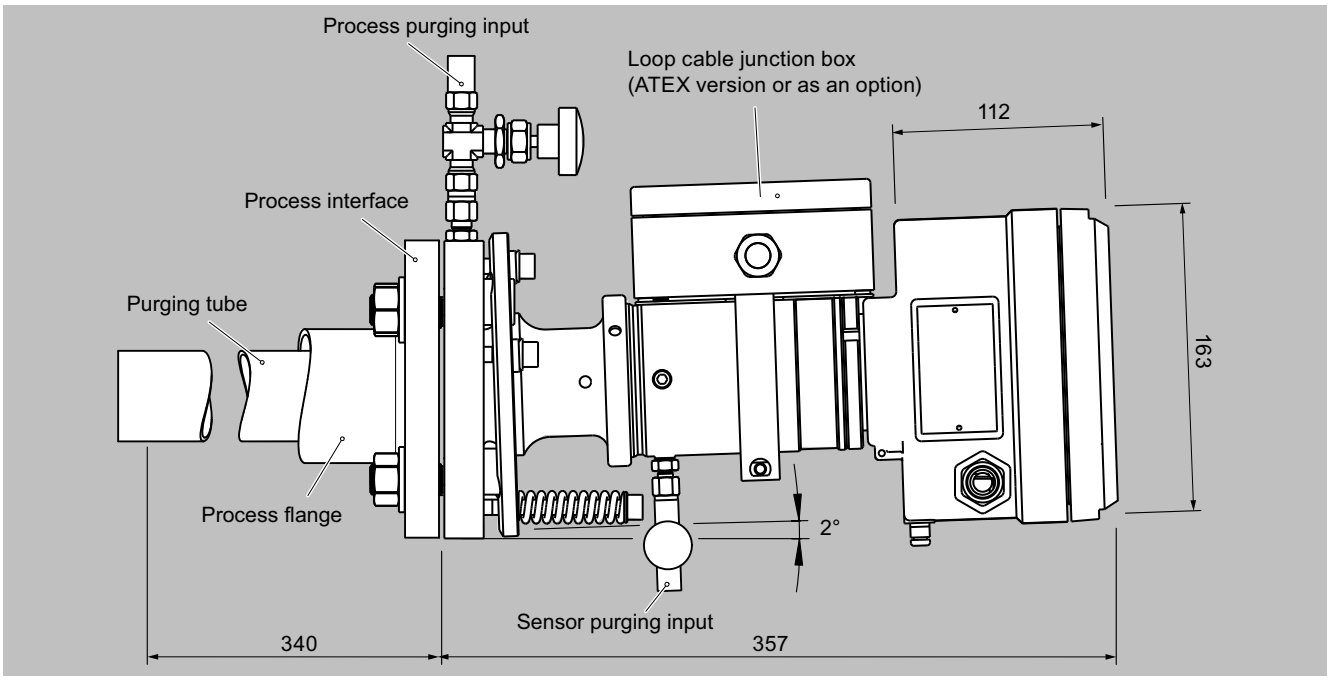
Technical specifications (continued)

In situ O2 gas analyzer	
- for ANSI4"/150 lbs	Approx. 12 kg
Connection dimension customer flange	DN 50/PN 25, DN 50/PN 40 or ANSI 4"/150 lbs
Electrical characteristics	
Auxiliary power	24 V DC nominal (18 ... 30.2 V DC)
Power consumption, maximum	10 VA
EMC	In accordance with EN 61326-1
Electrical safety	In accordance with EN 61010-1
Fuse specifications	T1.6L250V
Dynamic performance	
Warm-up time at 20 °C ambient temperature	Approx. 15 min
Response time (T90)	Approx. 2 s, depends on application
Integration time	0 ... 100 s, selectable
Influencing variables	
Variations in ambient temperature	< 0.5%/10 K of the measuring range
Process gas temperature	With compensation: < 1%/100 K of the measuring range
Variations in atmospheric pressure	Negligible
Process gas pressure	O_2: With compensation: < 1%/4 000 hPa of the measuring range
Variations in supply voltage	Negligible
Electrical inputs and outputs	
Number of measurement channels	1
Analog outputs	2 outputs, 4 ... 20 mA, floating, ohmic resistance max. 660 Ω. External isolating power supplies may have to be provided by the customer.
Analog inputs	2 inputs, designed for 4 ... 20 mA, 120 Ω
Digital outputs	2 outputs, with changeover contacts, configurable, 24 V/0.5 A, floating, single-pole single throw (SPST)
Digital input	1 input, designed for 24 V, floating, configurable
Service port	Ethernet 10BaseT (RJ45)
RS 485 PROFIBUS DPV0 version	Two-wire interface, up to 3 Mbps, -7 ... 12 V
RS 485 Modbus version	Two-wire interface, up to 115 200 bps, -7 ... 12 V
Connecting cable to customer interface	Not included in standard delivery, permanently installed for ATEX or optional for standard
Analog connecting cable (only supplied cables may be used for ATEX configuration!)	10 x 2, with shielding in twisted-pair configuration (depending on type and number of I/Os used)
PROFIBUS DP connecting cable (only supplied cables may be used for ATEX configuration!)	1 × 2 + 4 (PROFIBUS DP hybrid cable)
Modbus connecting cable (only supplied cables may be used for ATEX configuration!)	1 × 2 + 3, with shielding in twisted-pair configuration
Cable length for ATEX configuration	3 m
Cable cross-section	Min. 0.34 mm²
Cable diameter	8 ... 12 mm or 13 ... 18 mm
Minimum bending radius ATEX-PROFIBUS	110 mm
Sensor cable	Not included in standard delivery, permanently installed for ATEX or optional for standard
Sensor cable type configuration	4 × 2, with shielding in twisted-pair configuration
Cable cross-section	Min. 0.34 mm²
Cable jacket	PUR (polyurethane)
Dimensions	• Diameter: 11 mm • Length: up to 25 m
Minimum bending radius	ATEX: 85 mm

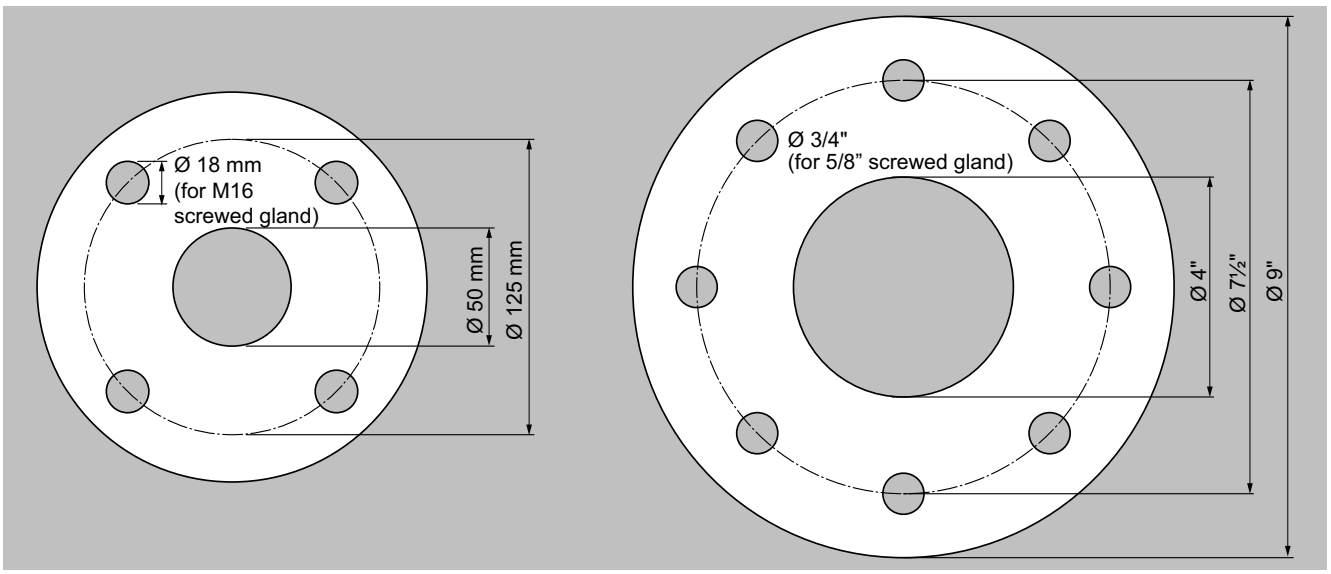
Technical specifications (continued)

In situ O2 gas analyzer	
Climatic conditions	
Ambient temperature range	**Note** The display on the detector side must not be exposed to direct solar radiation. • -20 ... +55 °C during operation (additional solar radiation not permissible!) • -40 ... +70 °C during transport and storage
Temperature range on the sensor side of the process interface (connection plate)	-20 ... +70 °C
Atmospheric pressure	800 ... 1100 hPa (for ATEX- and FM version)
Humidity	< 100% rel. humidity
Measuring conditions	
Measurement path	0.3 ... 8 m (other lengths: please contact Siemens)
Process gas pressure, temperature	• O_2: 900 ... 1 100 hPa, 0 ... 600 °C • O_2: 700 ... 5 000 hPa, 0 ... 200 °C
Dust load	The influence of a high dust load is complex, and depends on the optical path length and particle size distribution.
Purging	
Purging gas	Nitrogen (for O_2 applications)
• Quality	O_2 application: Purity better than 99.7% in order to achieve full performance. For oxygen measurements, an O_2 content < 0.01 vol% in the purging gas is recommended.
• Dew point	< -10 °C, condensation on the optics must be avoided
Sensor purging	
• Max. overpressure in the sensor	500 hPa
• Purging gas temperature on sensor side	0 ... +55 °C
• Flow	O_2 application: When commissioning a sensor enclosure previously filled with air: 3 ... 5 l/min (for at least 15 min), subsequently: at least 0.25 l/min
Purging on the process side (optional)	
• Pressure at purging gas inlet	2 000 ... 8 000 hPa
• Flow	Dependent on process gas pressure, process gas velocity, dust load, moisture, etc. up to max. 50 l/min

Dimensional drawings



SITRANS SL, transmitter/detector unit (same enclosure for DN50/PN25 process interface version), dimensions in mm



Connection dimensions of process flanges provided by customer DN50/PN25 and ANSI 4"/150 lbs

Note

The SITRANS SL sensors must be accessible from the side. A space of at least 60 cm must be provided next to the SITRANS SL transmitter and detector units in order to facilitate maintenance and servicing.

To fulfill the safety requirements, a clearance of at least 10 cm must be provided around the SITRANS SL to maintain cooling.

Circuit diagrams

Electrical connections

Non-Ex version connection cable - customer interface

Terminal block in the receiver enclosure			Function/voltage	Ethernet cable
1	+		Power supply 19 ... 30.2 V, 10 VA[1]	
2	-			
3	Normally closed under power[4]		Digital output 0 (relay) 30 V, 0.5 A[3]	
4				
5	Normally closed under power[4]		Digital output 1 (relay) 30 V, 0.5 A[3]	
6				
7	+		Digital input 0 0 ... 30 V[2]	
8	-			
9	+		Analog output 0 (measurement) 30 V, 24 mA[3]	
10	-			
11	+		Analog output 1 (measurement) 30 V, 24 mA[3]	
12	-			
13	PROFIBUS A line (RxD/TxD_N - data inverted)	Modbus D1 (RxD/TxD_N - data inverted)	RS 485 (PROFIBUS / Modbus) -7 ... +12 V DC	
14	PROFIBUS B line (RxD/TxD_P - data not inverted)	Modbus D0 (RxD/TxD_P - data not inverted)		
15	PROFIBUS/Modbus shield			
16	T_x+		Ethernet[5]	White/orange
17	T_x-			Orange
18	R_x+			White/green
19	R_x-			Green
20	+		Analog input 0 (temperature) 0 ... 30 mA[2], 120 Ω	
21	-			
22	+		Analog input 1 (pressure) 0 ... 30 mA[2], 120 Ω	
23	-			
24			Grounding	
25			Grounding	
Mass			Grounding	
Mass			Grounding	Shielding

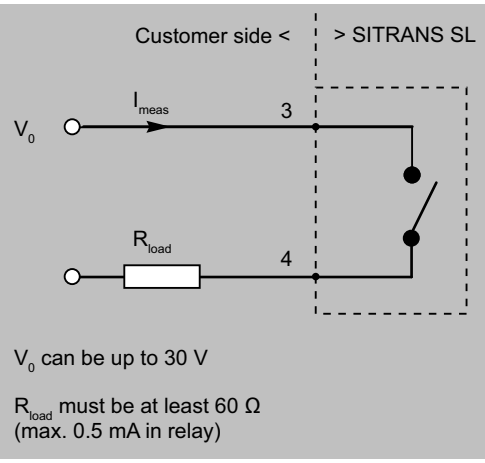
1) Maximum power consumption of SITRANS SL.
2) Maximum input values.
3) Maximum output values.
4) Note: "Normal operation" stands for normal operation of the analyzer. The system is connected to the voltage source and is running without problems; no error message generated or displayed. "Normally under power" refers to the status of the relay under the above-named normal operation. The relay contact of the alarm signal is closed.
5) We recommend that the Ethernet connection is not made via the connecting cable to the Ethernet terminals in the detector unit. Instead, the Ethernet connection should be made via the sensor cable connection set which is optionally available for the detector side.

Examples of digital output and analog output

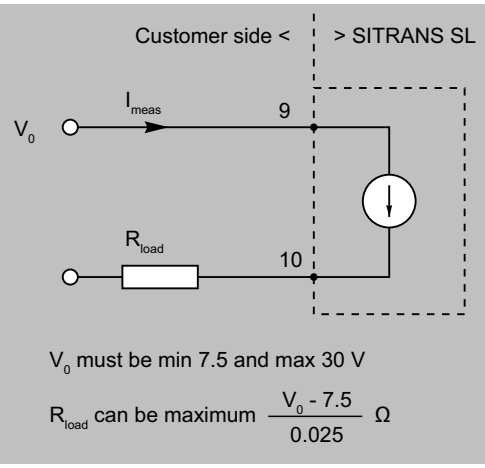
Caution

Please note that an external isolating power supply may be required!

Circuit diagrams (continued)



Example of digital output 0



Example of analog output 0

Sensor cable junction box on the detector side (ATEX version)

Terminal strip in junction box		Function	Color code
1	+	24 V DC power supply for transmitter unit	Red
2	-		Blue
3	Com +	Communication with transmitter	Pink
4	Com -		Gray
5	Sync +	Synchronization with transmitter	White
6	Sync -		Brown
7	NC	Not used	-
8	Tx+	Ethernet	Gray/pink
9	Tx-		Red/blue
10	Rx+		Black
11	Rx-		Violet
PE terminal	-	Grounding	Green
PE terminal		Grounding	Yellow
Gland		Grounding	Shielding