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Oggetto: **Decreto DVA-DEC-2012-0000253 del 08/06/2012 – Autorizzazione Integrata Ambientale per l'esercizio della centrale termoelettrica della società ENEL PRODUZIONE S.p.A. di Brindisi – Art.3 comma 3 Piano di adeguamento dei sistemi SME alla norma UNI EN 14181.**

Id. 13508136

L'ENERGIA CHE TI ASCOLTA.

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In riferimento al decreto AIA in oggetto ed alle prescrizioni ivi contenute per quanto attiene l'adeguamento dei sistemi di monitoraggio in continuo delle emissioni aeriformi convogliate ai camini del 4 gruppi termoelettrici alla norma UNI EN 14181, da realizzarsi entro 24 mesi dal 28 giugno 2012, è stato elaborato il documento allegato "**Norma UNI EN 14181:2005 - Piano di adeguamento dei Sistemi di Monitoraggio in continuo delle Emissioni C.le Federico II**".

Distinti saluti.

Antonino Ascione
IL RESPONSABILE

Il presente documento è sottoscritto con firma digitale ai sensi dell'art. 21 del d.lgs. 82/2005. La riproduzione dello stesso su supporto analogico è effettuata da Enel Servizi e costituisce una copia integra e fedele dell'originale informatico, disponibile a richiesta presso l'Unità emittente.

Allegato: Piano di adeguamento dei Sistemi di Monitoraggio in Continuo delle Emissioni C.le Federico II

Id. 13508136

Norma UNI EN 14181:2005 Piano di Adeguamento dei Sistemi di Monitoraggio in Continuo delle Emissioni C.le di Brindisi

DVA-DEC-2012-0000253 del 08/06/2012

Indice/Index

1. PREMESSA

Con Decreto del Ministero dell'Ambiente e della tutela del territori e del mare prot. DVA_DEC-2012-0000253 dell'08/06/2012, avviso pubblicato in G.U. in data 28 giugno 2012, è stata rilasciata alla società ENEL Produzione S.p.A, l'autorizzazione Integrata ambientale per l'esercizio della centrale termoelettrica ubicata nel Comune di Brindisi, ai sensi del decreto legislativo 3 Aprile 2006, n.152 e s.m.i.

2. OGGETTO

Con la presente, si ottempera alla prescrizione per cui "entro 3 mesi decorrenti dalla data di pubblicazione dell'avviso relativo al decreto AIA il Gestore dovrà presentare all'Autorità Competente per tramite di ISPRA un piano di adeguamento dei sistemi SME alla norma UNI EN 14181 da realizzarsi non oltre 24 mesi".
In particolare si riportano i requisiti della nuova strumentazione SME e un crono-programma di massima sulle tempistiche di adeguamento.

Nel Piano di Monitoraggio e Controllo (di seguito PMC) allegato al Decreto suddetto, tra i requisiti tecnici riportati sono evidenziate specifiche caratteristiche dei Sistemi Monitoraggio in Continuo delle emissioni (di seguito SME) che richiedono adeguamenti hardware e software.
Le modalità di gestione dell'adeguamento del sistema SME è indicata ai punti 3.7 e 8.1 del PMC.

3. ADEGUAMENTO SISTEMA DI MONITORAGGIO EMISSIONI

In riferimento a quanto prescritto al punto 9.2.1 8. d) pag. 89 del Parere Istruttorio Conclusivo della centrale termoelettrica ENEL Produzione S.p.a di Brindisi, l'attività generale di adeguamento prevede la sostituzione degli analizzatori installati sugli SME dei camini 1, 2, 3 e 4 analisi con nuovi analizzatori (volti ad assicurare lo standard QAL1) e l'applicazione delle procedure di assicurazione della qualità (QAL2 e QAL3).

Le misure da eseguire a cura di laboratori saranno demandate a strutture accreditate UNI EN 17025 per le metodiche previste.

3.1. L'attuale sistema di analisi delle emissioni

L'attuale sistema di monitoraggio emissioni prevede un sistema estrattivo, per il camino con cabina di analisi posta a quota 73 mt con la seguente strumentazione rilevante:

- Analizzatore O2 Modello Magnos 6G costruttore H&B con fondo scala 0-25%
- Analizzatore NOx Modello Radas 1G costruttore H&B con fondo scala 0-500 mg
- Analizzatore CO Modello Uras 4 costruttore H&B con fondo scala 0-600 mg
- Analizzatore SO2 Modello Uras 4 costruttore H&B con fondo scala 0-300 mg

Inoltre è installato il seguente analizzatore in situ per il controllo delle polveri:

- Opacimetro Modello OMD 41 costruttore Sick con fondo scala 0-0.4 Estinzione

I dati rilevati sono inviati al sistema centrale presso la sala controllo per l'elaborazione dei dati ai sensi degli Allegati II e VI alla Parte V del Dlgs 152/06, la verifica del rispetto dei limiti e la stesura della reportistica.

3.2. Requisiti nuova strumentazione SME

La nuova strumentazione SME sarà conforme alla norma UNI EN 15259:2007 ed alle metodiche previste per le misure in continuo delle emissioni in Allegato G alla nota ISPRA "Definizione di modalità di attuazione dei Piani di Monitoraggio e Controllo".

Come richiesto dalla Norma UNI EN 14181 : 2005 – Assicurazione di Qualità dei sistemi automatici di misura - sarà quindi idonea al proprio compito di misurazione del parametro e composizione del gas effluente secondo l'utilizzo del procedimento

QAL1 e sarà sottoposta con regolarità a manutenzione, test di funzionalità e taratura previsti dalla norma stessa.
Il costruttore/fornitore rilascerà oltre alla certificazione QAL1.

Si provvederà ad adeguare elettricamente i fondo scala degli strumenti, in base alle indicazioni della UNI EN 15267-3 e ad eventuali previsioni ISPRA al riguardo, al valore limite di emissione vigente nei successivi periodi di applicazione dell'AIA, come previsti al punto 9.2.1 – 8 del Parere Istruttorio.

Nell'allegato 1 si riportano i dati tecnici della strumentazione sopra citata e nell'allegato 2 si riportano le relative certificazioni QAL1 e TüV.

3.2.1. *Fornitura*

La nuova fornitura per l'analisi degli inquinanti gassosi comprenderà per ogni unità termoelettrica:
n° 1 sonda di prelievo del campione
n° 1 linee di prelievo del tipo "a caldo"
n. 1 frigorifero abbattitore di umidità;
n. 2 Pompe di prelievo in configurazione ridondata;
n. 1 analizzatore di CO;
n. 1 analizzatore di SO_2;
n. 1 analizzatore di NO_x (con fornetto convertitore);
n. 1 analizzatore di polveri
n. 1 analizzatore di O_2 di tipo paramagnetico.

La fornitura comprenderà anche:
n.1 strumentazione per la determinazione della velocità/portata;
n.1 strumentazione per la determinazione di umidità.

4. SOFTWARE

L'implementazione del nuovo sistema di acquisizione dati ed elaborazione è finalizzato, oltre al rispetto della normativa vigente in materia di controllo in continuo e elaborazione dei dati di emissione (D.lgs 152/06), a conseguire gli standard richiesti in AIA in accordo alla normativa di riferimento UNI EN 14181.

In particolare il sistema sarà in grado di gestire le procedure di assicurazione della qualità QAL2 (controllo del limite superiore di validità della curva di taratura) e QAL3 (elaborazione carte di controllo CUSUM).

5. CRONOPROGRAMMA

Si riporta, di seguito, un cronoprogramma delle attività di adeguamento dei sistemi SME.

Attività	Termine ultimo
Predisposizione ciminiere per analizzatori	30/09/2012
Aggiudicazione ordine	31/12/2012
Fornitura della strumentazione	30/06/2013
Montaggio strumentazione	31/12/2013
Messa in servizio	31/03/2014
Prove di QAL 2 (invio report per inserimento curve di taratura)	31/05/2014
Avvio procedura periodica QAL3	31/05/2014 (*)

(*) Tale prova non è prevista per l'analizzatore di polveri e strumento di misura umidità in quanto gli stessi sono dotati di sistema di auto taratura con frequenza di esecuzione molto ravvicinata (1-2 ore).

Un piano di dettaglio suddiviso per unità non è al momento realizzabile in quanto risulta dipendente dai programmi di fermata delle unità stesse e dalle esigenze puntuali della rete elettrica nazione ad oggi non note.

A valle del completamento delle attività su ciascuno dei camini ne sarà data comunicazione a ISPRA, come da prescrizioni del punto A) della nota "Definizione di modalità di attuazione dei Piani di Monitoraggio e Controllo".

6. MONITORAGGIO EMISSIONI DURANTE LE ATTIVITÀ DI ADEGUAMENTO

Durante l'attività di adeguamento degli SME l'attuale strumentazione SME verrà mantenuta in servizio e in piena efficienza fino alla messa in servizio della nuova strumentazione.

7. ALLEGATI

ALLEGATO 1 – Dati Tecnici Strumentazione

ALLEGATO 2 – Certificati QAL1 della Strumentazione

Dust Measuring Devices

Scattered light dust monitor with backward scattering

Model Name DUSTHUNTER SB100

The DUSTHUNTER SB100 is an approved measuring device for dust at very low to medium concentrations in challenging applications, e.g. in hot or corrosive gases. The measurement is based on the backward scattering of light. Installation is made from one side only. Two different penetration depths are possible. Automatic compensation of background radiation, therefore no light absorber necessary. An automatic check of zero and reference point as well as contamination monitoring is integrated in the device.

At a glance

- For very low to medium dust concentrations
- One-side installation
- Contamination check
- Automatic check of zero and reference point
- Automatic compensation of background radiation, therefore no light absorber necessary
- For medium to large duct diameters

Your benefits

- Easy installation, commissioning, and operation
- Measurement independent of gas velocity, humidity and particle charge
- Approved according to EN 15267-3
- Low maintenance due to self-monitoring

Fields of application

- Emission monitoring of power stations and waste incineration plants
- Monitoring of filter plants
- Monitoring of dust loads in factory workshops
- Control of fresh air supplies and exhaust air plants

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Literature

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Applications
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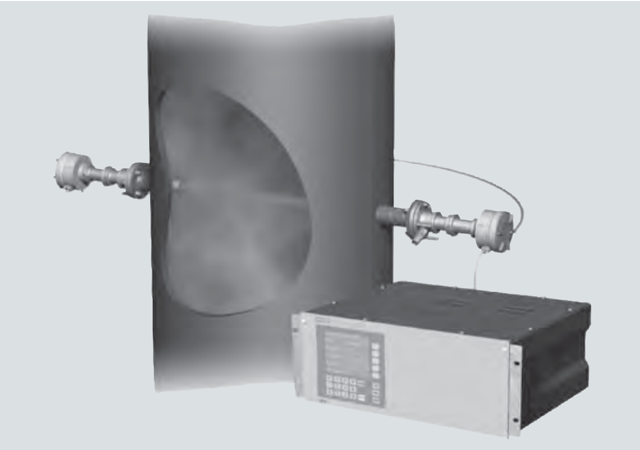
Technical data

Measuring principle:	Scattered light backward
Measuring ranges:	Dust content: 0 ... 10 mg/m³ / 0 ... 200 mg/m³
Remark:	Other measuring ranges on request
Measuring paths:	0.8 ... 1.8 m, Penetration depth: 0.4 ... 0.65 m
Process temperature:	-25 ... 600 °C
Process pressure:	50 ... 30 hPa other pressure ranges on request
Process gas humidity:	non-condensing
Duct diameter:	≥0.5 m
Ambient temperature:	With MCU with purge air supply: -25 ... 45 °

	C, Standard: -25 ... 60 °C
Ambient humidity:	0 ... 95 % relative humidity; non-condensing
Conformities:	2000/76/EC, 2001/80/EC, 27. BImSchV., EN 14181, EN 15267-3, MCERTS, German Clean Air Regulations
Electrical safety:	CE
Enclosure rating:	IP 66
Analogue outputs:	3 outputs: 0/2/4 ... 20 mA, 750 Ω
Analogue inputs:	2 inputs: 0 ... 20 mA 2 additional inputs if using I/O modules
Digital outputs:	5 relay contacts: 48 V, 1 A
Digital inputs:	4 inputs
Interfaces:	RS-232, RS-485, USB 1.1
Bus protocol:	Ethernet (option), MODBUS, PROFIBUS-DP (option)
Operation:	Via LC-display or software SOPAS ET
System components:	Sender/receiver unit, MCU control unit
Test functions:	Automatic control cycle for zero and span point, Contamination check
Note:	The scope of delivery depends on application and customer specifications.

Overview

LDS 6 is a diode laser gas analyzer with a measuring principle based on the specific light absorption of different gas components. LDS 6 is suitable for fast and non-contact measurement of gas concentrations or temperatures in process or flue gases. One or two signals from up to three measuring points are processed simultaneously by one central analyzer unit. The in-situ cross-duct sensors at each measuring point can be separated up to 700 m from the central unit by using fiber-optic cables. The sensors are designed for operation under harsh environmental conditions and contain a minimum of electrical components.



LDS 6, typical installation with transmitted-light sensors

Benefits

The in-situ gas analyzer LDS 6 is characterized by a high availability and unique analytical selectivity, and by a broad scope of suitable applications. LDS 6 enables the measurement of one or two gas components or - if desired - the gas temperature directly in the process:

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

LDS 6 properties:

- Little installation effort
- Minimum maintenance requirements
- Extremely rugged design
- High long-term stability through built-in, maintenance-free reference gas cell, field calibration is unnecessary
- Real-time measurements

Moreover, the instrument provides warning and failure messages upon:

- Need for maintenance
  - Erroneous reference function
  - Bad signal quality
- Violation of a lower or upper alarm level for the measured variable
- Transmitted amount of light violating an upper or lower limit

Application

Applications

- Process optimization
- Continuous emission monitoring for all kinds of fuels (oil, gas, coal, and others)
- Process measurements in power utilities and any kind of incinerator
- Process control
- Explosion protection
- Measurements in corrosive and toxic gases
- Quality control
- Environmental protection
- Plant and operator safety

Sectors

- Power plants
- Steel works
- Cement industry
- Chemical and petrochemical plants
- Automotive industry
- Waste incinerators
- Glass and ceramics production
- Research and development

Special applications

In addition to the standard applications, special applications are available upon request.

3

Design

The gas analyzer LDS 6 consists of a central unit and up to three in-situ sensors. The connection between the central unit and the sensors is established by a so-called hybrid cable, which contains optical fibers and copper wires. An additional cable connects the transmitter and receiver parts of the cross-duct sensor.

Central unit

The central unit is housed in a 19" rack with 4 holders for mounting

- in a hinged frame
- in racks with or without telescopic rails

Display and control panel

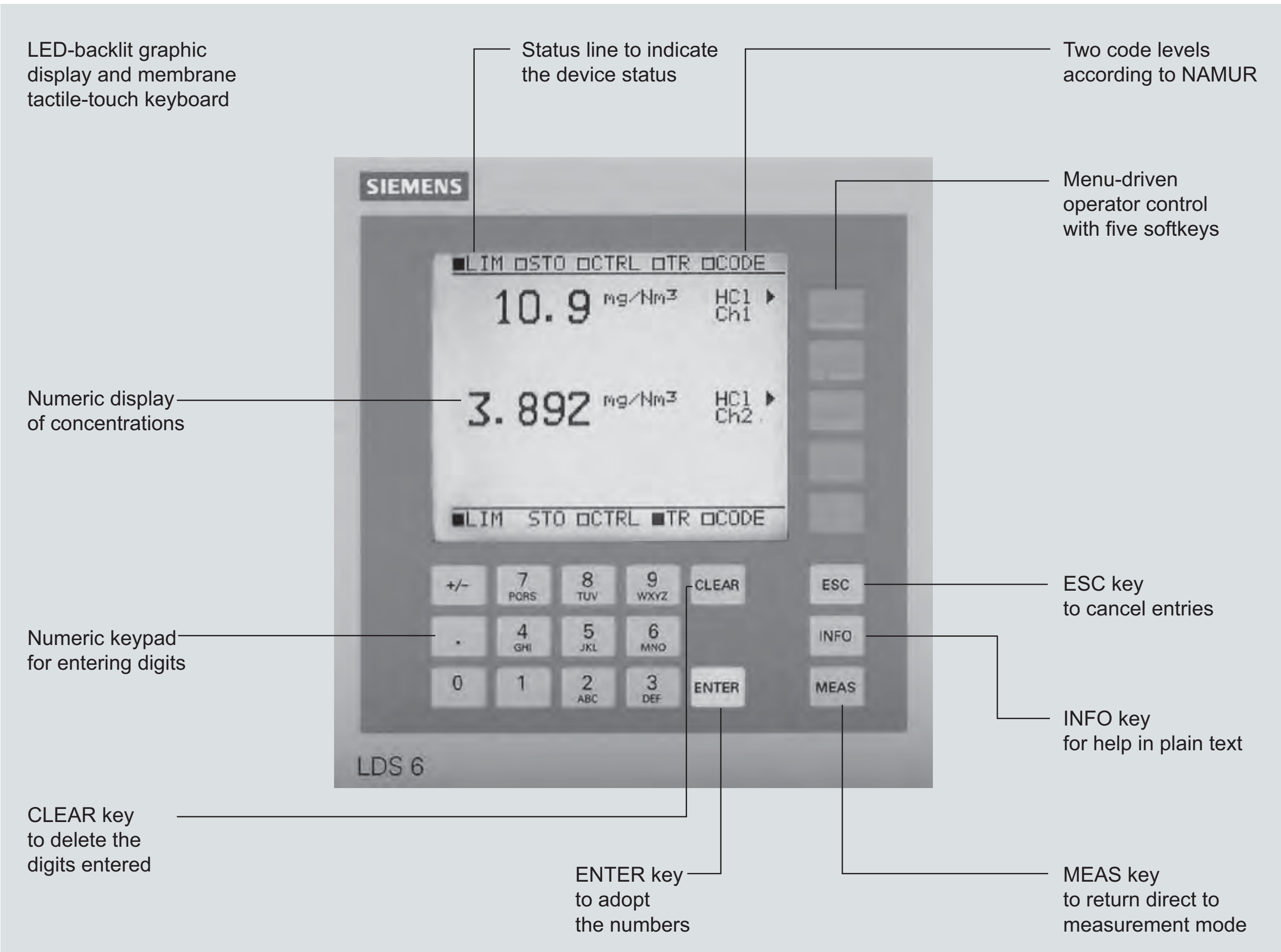
- Large LCD field for simultaneous display of measurement result and device status
- Contrast of the LCD field is adjustable via the menu
- LED background illumination of the display with energy-saving function
- Easy-to-clean membrane touch pad with softkeys
- Menu-driven operation for parameterization and diagnostics
- Operation support in plain text

Input and outputs

- One to three measurement channels with hybrid connections for the sensors at the measuring points
- 2 analog inputs per channel for process gas temperature and pressure
- 2 analog outputs per channel for gas concentration(s) or for gas temperature and concentration For selected versions, the transmission can be read out as an alternative.
- 6 freely configurable binary inputs per channel for signaling faults or maintenance requests from external temperature or pressure transducers or sensor purging failure.
- 6 freely configurable binary outputs per channel (signaling of fault, maintenance requirements, function control, transmission limit alarm, concentration limit alarm, store analog output)

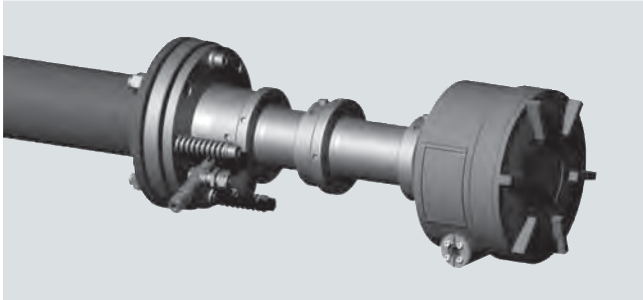
Communication

Network connection: Ethernet (T-Base-10) for remote diagnostics and maintenance.



LDS 6 central unit, membrane keyboard and graphic display

Cross-duct sensors



Sensor CD 6, transmitter or receiver unit

- In-situ cross-duct sensors, configured as transmitter and receiver unit, connected via sensor cable
- Connection to the LDS 6 central unit by a so-called hybrid cable, max. length 700 m
- Stainless steel, some painted aluminum
- IP65 degree of protection for sensor
- Adjustable flanges with flange connection
- DN 65/PN 6, ANSI 4"/150 lbs
- Optional flameproof window flanges with dimensions: DN 65/PN 6, DN 80/PN 16, ANSI 4"/150 lbs, other process interfaces available on request
- Purging facilities on the process and the sensor sides, configurable application with purging gas connections for:
  - Instrument air
  - Purging air blower
  - Steam
  - Nitrogen
  - Process gases to which the pressure equipment directive cat. 2 does not apply
- In combination with high-pressure window flanges, purging with instrument air or nitrogen is possible
- Fast connectors for cleaning the measurement openings and the sensor window
- Optional: Version with explosion protection in accordance with ATEX II 1 G Ex ia IIC T4, ATEX II 1 D IP65 T135°C, Cert. No. DEMKO 06 ATEX 139648X. Certificates according to IEC and TIIS are also available
- Sensor type CD6 is compliant with the pressure equipment directive

Parts in contact with the process gases

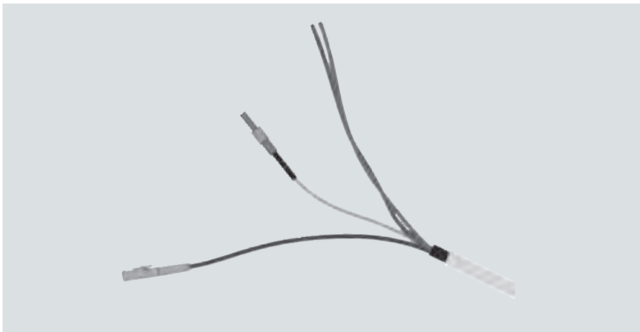
The sensors normally do not come into contact with the process gas, since purging with a gaseous media is applied at the process side. Stainless steel purging gas tubes in front of the sensor windows immerse slightly into the process gas and thus limit the purging volume. Special materials such as Hastelloy, plastics (PP) and ceramics are available on request.

Hybrid and sensor cables

A combination of fiber-optic cables and twisted copper wires connects the sensors to the central unit. The hybrid cable connects the central unit with the transmitter unit of the sensor, the sensor cable connects the transmitter and receiver units of the sensor.

For installation in Ex-protected environments, the legislative regulations have to be complied with, such as the spatial separation of intrinsically-safe from non-intrinsically-safe cables.

- Max. 700 m between central unit and measuring point
- Hybrid and sensor cables
  - Multimode fiber-optic cable, provided with SMA connections for transmission of the measured signal
  - Two-wire copper cable, in twisted pair version, for +24 V supply of the detector electronics (+12 V in the case of Ex-suitable instruments)
- Additionally for the hybrid cable:
  - Single-mode fiber-optic cable, configured double-sided with E2000 connectors for transmission of laser light
- Rugged cable sheath for laying in open cable ducts or ductworks
- Sheath material: oil-resistant polyurethane



Connections of the hybrid cable

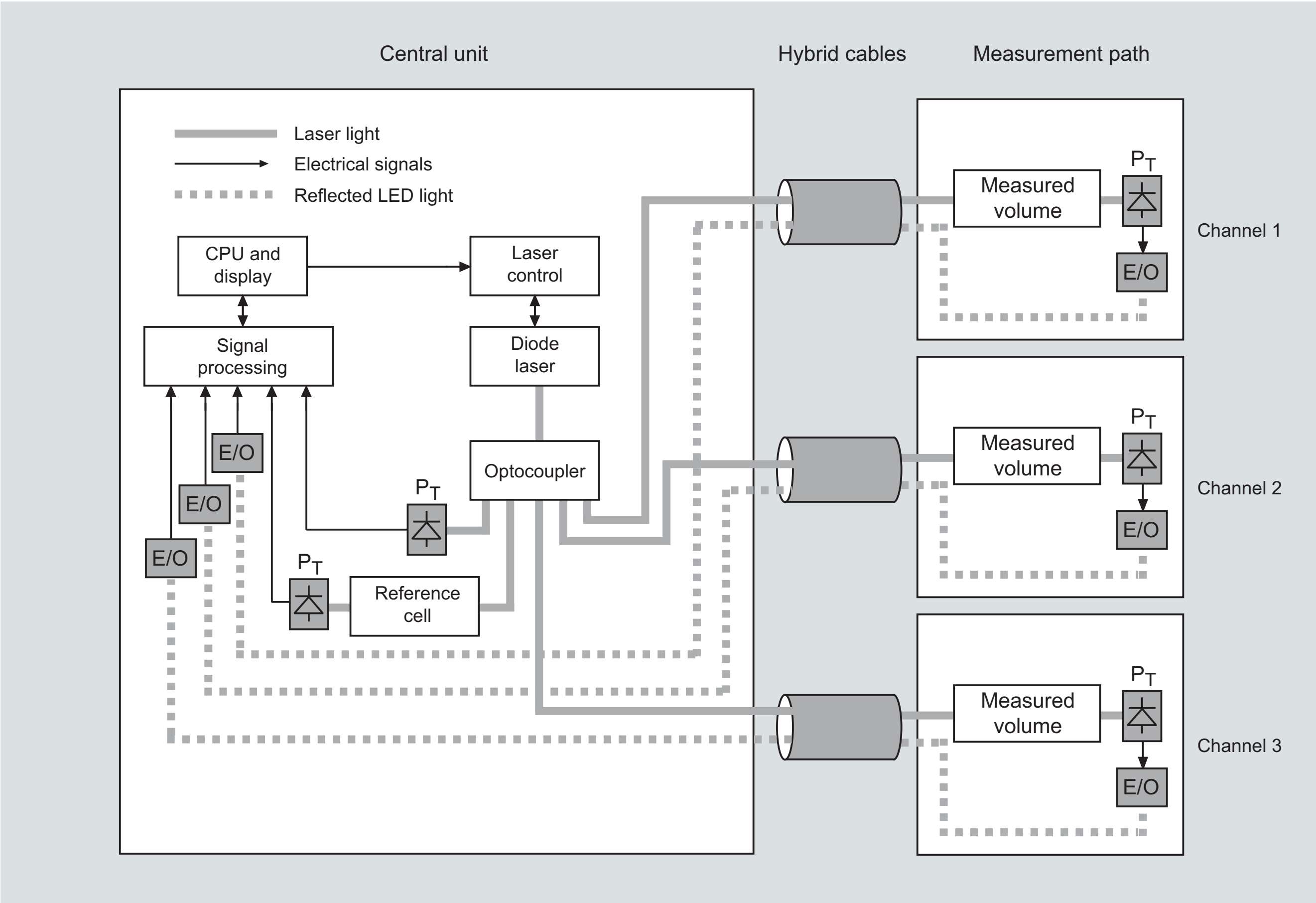
General information

Function

Operating principle

LDS 6 is a gas analyzer employing single-line molecular absorption spectroscopy. A diode laser emits a beam of near-infrared light, which passes through the process gas and is detected by a receiver 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 result is a fully resolved single molecular line which is analyzed in terms of absorption strength and line shape. The influence of cross-sensitivities on the measurement is negligible, since the quasi-monochromatic laser light is absorbed very selectively by only one specific molecular line in the scanned spectral range.

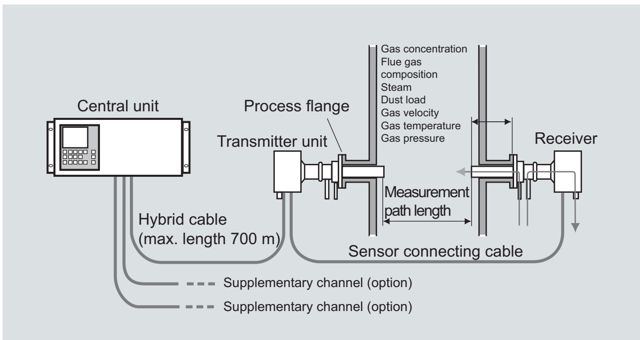


Basic design of the LDS 6

<u>Configuration examples:</u>

A feature of the in-situ analytical procedure is that the physical measurement takes place directly in the stream of process gas, and usually also 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 LDS 6 and must therefore be systematically investigated for each new application.

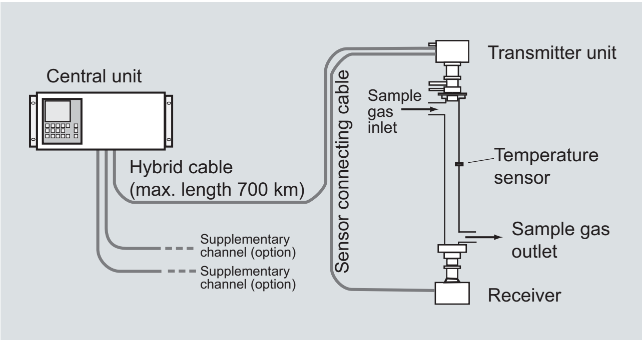
A feature of the standard applications defined in the ordering data of the LDS 6 is that the typical process conditions are well-known and documented, and that the guaranteed measuring properties can be proven by reference installations. If you cannot find your application among the standard applications, please contact Siemens. We will be pleased to check your possible individual application of the LDS 6. You can find an application questionnaire on the LDS product sites on the Internet.



Typical transmitted light setup of LDS 6, in-situ

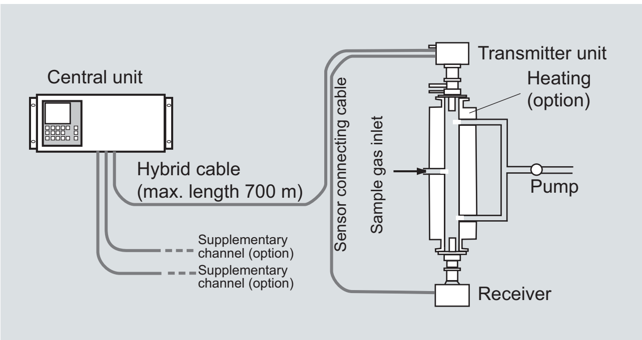
To avoid contamination of sensor openings on the process side, clean gaseous purging media are used such as instrument air, N_2 or steam. Purging air tubes on the sensor heads, which slightly penetrate into the process gas stream, define the effective measuring path length.

The LDS 6 can measure in both the transverse and longitudinal directions of the process gas flow. In certain cases, the process conditions make it necessary to condition the sample gas stream in a bypass line with respect to process temperature, pressure and/or optical path length. Further treatment of the process gas, such as drying or dust precipitation, is usually unnecessary.



Typical transmitted light setup of LDS 6, in bypass

A flow cell is available by special application for the LDS 6 which has been specially optimized for use with the LDS 6 and its transmitted-light sensors with respect to handling and measuring performance. It is designed to reduce surface effects, and is therefore also highly suitable for polar gases like ammonia. This flow cell is available in heated and non-heated versions. Wheel mounted and wall mounted versions are available.



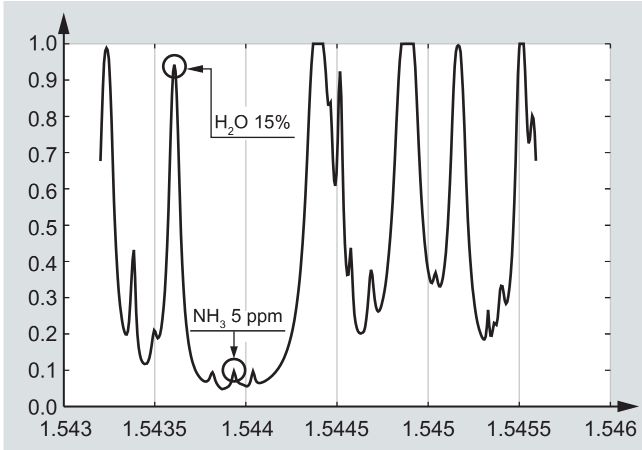
Measuring configuration of LDS 6 with heated flow cell

General

LDS 6 is connected to the measuring points by fiber optics. The laser light is guided by a single-mode fiber from the central unit to the transmitter unit of the in-situ sensor. The sensor consists of a transmitter and a receiver; the distance between them defines the measurement path. In the receiver box, the light is focused onto a suitable detector. The detector signal is then converted into an optical signal and transmitted via a second optical fiber to the central unit, where the concentration of the gas component is determined from the detected absorption signal.

LDS 6 usually measures a single gas component by means of the absorption capacity of a single fully resolved molecular absorption line. The absorption results from conversion of the radiation energy of the laser light into the internal energy of the molecule. In the working range of the LDS 6, both rotation-vibration transitions and electronic transitions - such as with O_2 - can be triggered.

In some specific cases, two components can be measured simultaneously if their absorption lines are so close to each other that they can be detected within the laser spectrum by one single scan (for example water (H_2O) and ammonia (NH_3)).



Absorption spectra of water and ammonia

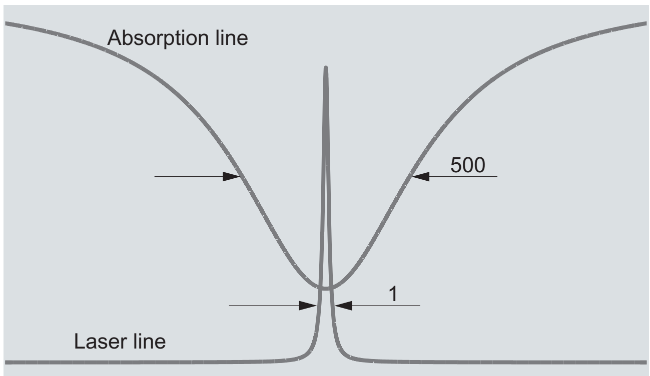
Moreover, in some applications it is possible to determine the gas temperature as a measured value. In this case, the ratio of the absorbance of two characteristic lines of the same molecule measured at the same time in the same volume gives the actual temperature in the process gas.

Typical measurable gases for LDS 6 are:

- Oxygen (O_2) for low and high pressure
- Oxygen + temperature
- Hydrogen fluoride (HF) + water
- Hydrogen chloride (HCl) + water
- Ammonia (NH_3) + water
- Water vapor (H_2O)
- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- CO + CO_2

By using an internal reference cell normally filled with the gas measured, the stability of the spectrometer is permanently checked in a reference channel.

By doing so, the continuous validity of the calibration is ensured without the need to carry out external recalibration using bottled test gases or reference gas cells.



Typical spectral bandwidth of an absorption line compared to the bandwidth of the laser light.

General information

Influences on the measurement

Dust load

As long as the laser beam is able to generate a suitable detector signal, the dust load of the process gases does not influence the analytical result. By applying a dynamic background correction, measurements can be carried out without any negative impact. Under good conditions, particle densities up to 100 g/Nm^3 can be handled by the LDS 6. Varying dust loads are compensated by scanning the laser over the gas absorption line and the current background. At a scan position next to the absorption line, the instrument can "see" only absorption caused by the dust load where at the line center the signal is composed of the molecular absorption and the continuous, unspecific background absorption. With the wavelength modulation technique, the actual measured transmission is always compared with the baseline. After signal processing, phase-sensitive application delivers a signal only from the molecular line free of background.

The influence of a high dust load is complex and depends on the path length and particle size. The optical damping increases at longer path lengths. Smaller particles also have a large influence on the optical damping. With a combination of high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Temperature

The temperature influence on the absorption line strength is compensated by a correction factor determined during calibration. A temperature signal can be fed into the instrument from an external temperature sensor. This signal is then used to correct the influence of the temperature on the observed line strength. If the temperature of the sample gas remains constant, it is alternatively possible to carry out a static correction using a preset value.

At high process gas temperatures, generally from approximately 1 000 °C, there may be noticeable broadband IR radiation of gas and dust, or flames may occasionally occur in the measurement path. An additional optical bandpass filter can be set upstream of the detector to protect it and prevent saturation by the strong background radiation.

Pressure

The gas pressure can affect the line shape of the molecular absorption line. LDS 6 uses a special algorithm to adapt the line shape. Additionally, an external pressure signal can be fed to the instrument to provide complete compensation for the pressure influence including the density effect.

Cross-interferences

Since LDS 6 derives its signal from a single fully resolved molecular absorption line, cross-interferences with other gases are quite unlikely. LDS 6 is therefore able to measure the desired gas components very selectively. In special cases, the composition of the process gas might have an influence on the shape of the absorption line features. This influence is compensated by analyzing the full shape of the detected signal curve applying specific algorithms.

Optical path length

The absorption values analyzed by the LDS 6 are typically small. As a result of Beer-Lambert's law, the absorption of laser light depends on the optical path length within the gas. Therefore, the precision in determining the effective optical path length in the process might limit the overall precision of the measurement. As the sensor openings toward the process normally need to be purged to keep them clean over a long period of time, the thickness of the mixing zone between the purging medium and the process gas and its concentration distribution need to be considered. In a typical in-situ installation with some meters of path, the influence of the purging gas on the effective path length can be neglected.

Path length and dust load are mutually influencing: the higher the dust load in the process, the shorter the max. possible path length.

Maintenance and fault messages

LDS 6 outputs different warnings via relays:

- Need for maintenance (measured value is not influenced)
- Operating error (measured value might be influenced)

Note

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

- Different purging media, such as instrument air, ambient air, nitrogen or steam
- Different purging modes on process and sensor sides
- Special materials of purging tubes and/or sensor flanges
- Cooling or heating of the sensors
- Explosion-protected sensor configurations

Essential characteristics

- Integrated calibration adjustment with an internal reference cell
- Negligible long-term drifts of zero and span
- Dynamic background correction for varying dust loads
- Isolated signal outputs, 4 to 20 mA
- User-friendly, menu-driven operation
- Selectable time constants (response time)
- Two user levels with individual access codes for prevention of unwanted and unauthorized operations
- Operation according to NAMUR recommendations
- Monitoring of overall optical transmission
- Remote preventive maintenance and servicing via Ethernet/modem
- Straightforward replacement of the central unit, since connections can easily be removed
- Sensor and central unit housing free of wear and corrosion
- Easy operation with a numerical keypad and menu prompting

Certified versions for emission monitoring

The LDS 6 is available as certified instrument for emission monitoring of NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O. The certificates are issued by TÜV for Germany and MCERTS for the United Kingdom. For conducting regular calibration and linearity checks, test kits for ammonia, water and HCl should be used. These kits can be ordered separately as instrument accessories. For new analyzer orders, the NH_3, NH_3/H_2O and H_2O kits named "Version 2" must be ordered. For already installed analyzers, please contact Siemens for spotting the correct kit version, or consult the instrument manual.

Technical specifications

Analytical performance	
Measuring range	Internally adjustable
Detection limit under standard conditions: 25 °C gas temperature, 1 013 hPa, 1 m path length, 3 s integration time and constant ambient conditions. Calculated in accordance with VDI 2449, measured on every supplied analyzer during the temperature test (between 5 ... 45 °C) in accordance with VDI 4203.	Depending on gas: HF: 0.1 ppm HCl: 0.6/0.2 ppm NH_3: 0.5 ppm H_2O (top measuring range): 1 000 ppm O_2 (standard pressure): 1 000 ppm O_2 (high pressure): 1 000 ppm CO (one component): 300 ppm CO_2 (one component): 300 ppm CO/CO_2: 600/1 500 ppm
Smallest recommended measuring range	HF: 0 ... 5 ppm HCl: 0 ... 10 ppm NH_3: 0 ... 10 ppm H_2O (top measuring range): 0 ... 5 % O_2 (standard pressure): 0 ... 5 % O_2 (high pressure): 0 ... 5 % CO (one component): 0 ... 1.5 % CO_2 (one component): 0 ... 1.5 % CO/CO_2: 0 ... 3 / 0 ... 7.5 %

The maximum applicable measuring ranges can be found in the table of standard combinations. These can only be applied if the individual process conditions allow it. Please contact the Technical Support from Siemens for checking the applicability.

Accuracy (under standard conditions)	• 2 % of the measured value or minimum detection limit (whichever is largest) for: - NH_3 (all versions) - O_2 (not combined with temperature) - CO (all versions) - CO_2 (all versions) • 5 % of the measured value or minimum detection limit (whichever is largest) due to calibration gas uncertainties: - HF (all versions) - HCl (all versions) - H_2O - O_2 (combination with temperature)
Linearity (under standard conditions)	Better than 1 %
Repeatability (under standard conditions)	2 % of the measured value or minimum detection limit (whichever is largest) For Code ET and FT: in accordance with the requirements of 17th and 27th BImSchV
Zero point drift	Negligible
Measured-value drift	Negligible
Calibration interval	No recalibration required thanks to internal reference cell

General	
Concentration units	ppmv, vol.%, mg/Nm^3
Display	Digital concentration display (5 digits with floating decimal point)
Laser protection class	Class 1, safe to the eye
Certificates	CE marking, TÜV, MCERTS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Dimensions	177 x 440 x 380 mm
Weight	Approx. 13 kg
Mounting	Horizontal
Electrical characteristics	
Power supply	100 ... 240 V AC 50 ... 60 Hz, automatically adapted by the system; with a 3-channel central unit, an additional external power supply +24 V DC, 50 VA is included in the scope of delivery
Power consumption	50 W
EMC	According to EN 61326 and standard classification of NAMUR NE21
Electrical safety	According to EN 61010-1, overvoltage classification II
Fuse specifications	100 ... 240 V: T2.5L250V
Dynamic response	
Warm-up time at 20 °C ambient temperature	Approx. 15 min
Response time	Less than 3 s, application-dependent
Integration time	1 ... 100 sec, selectable
Influencing variables	
Ambient temperature	< 0.5 % of measured value/10 K
Atmospheric pressure	Negligible
Process gas pressure compensation	Recommended for all gases except O_2/low pressure
Process gas pressure range	Oxygen, high pressure: 1 ... 5 bar CO/CO_2: 0,95 ... 1.4 bar All other gases except O_2/low pressure: 0.95 ... 1.05 bar
Power supply changes	< 1 %/30 V
Electrical inputs and outputs	
Number of measurement channels	1 … 3, optional
Analog output	2 per channel, 4 ... 20 mA, floating, ohmic resistance max. 750 Ω
Analog inputs	2 per channel, designed for 4 ... 20 mA
Binary outputs	6 per channel, with changeover contacts, configurable, 24 V AC/DC/1 A, floating
Binary inputs	6 per channel, designed for 24 V, floating, configurable
Communication interface	Ethernet 10BaseT (RJ-45)
Climatic conditions	
Temperature range	5 ... 45 °C during operation, -40 ... +70 °C during transportation and storage
Atmospheric pressure	800 … 1 200 hPa
Humidity	< 85 % RH, above dew point (in operation and storage)

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Selection and ordering Data			Order No.
LDS 6 in-situ gas analyzer 19" rack unit for installation in cabinets			**7MB6121-** ■■■ **0 0 - 0** ■■■
Explosion protection			
Without, not suitable for connection to Ex sensors			0
Without, suitable for connection to Ex sensors in accordance with ATEX II 1 G Ex ia IIC T4, ATEX II 1 D IP65 T135°C			1
Measured component	Possible with application number		
O_2	11 ... 14; 20		A
O_2 / temp	12		B
NH_3	11; 15 ... 17; 22		C
NH_3 / H_2O	11; 15 ... 17; 22		D
HCl	11; 18; 22		E
HCl / H_2O	11; 18; 22		F
HF	11; 18	A)	G
HF / H_2O	11; 18	A)	H
CO	12 ... 14		J
CO / CO_2	14		K
CO_2	11		L
H_2O	11; 22		M
Application for channel 1	Application number		
Emission monitoring, non-certified	11		A
Combustion optimization	12		B
Safety monitoring	13		C
Process monitoring	14		D
SNCR-DeNOx	15		E
SCR-DeNOx	16		F
SCR-DeNOx/automotive	17		G
Filter optimization	18		H
Process monitoring (high pressure)	20		P
Emission monitoring, certified according to 17th BimschV and Mcerts, in combination with components C, D, E, F, M	22		T
Application for channel 2	Application number		
Channel 2 not used			X
Emission monitoring	11		A
Combustion optimization	12		B
Safety monitoring	13		C
Process monitoring	14		D
SNCR-DeNOx	15		E
SCR-DeNOx	16		F
SCR-DeNOx/automotive	17		G
Filter optimization	18		H
Process monitoring (high pressure)	20		P
Emission monitoring, certified according to 17th BImschV and Mcerts, in combination with components C, D, E, F, M	22		T

A) Subject to export regulations AL: 2B351A, ECCN: 2B351

Selection and ordering Data

		Order No.
LDS 6 in-situ gas analyzer 19" rack unit for installation in cabinets		**7MB6121- ■■■ 0 0 - 0 ■■■**
Application for channel 3 External 24 V DC power supply included in scope of delivery	Application number	
Channel 3 not used		**X**
Emission monitoring	11	**A**
Combustion optimization	12	**B**
Safety monitoring	13	**C**
Process monitoring	14	**D**
SNCR-DeNOx	15	**E**
SCR-DeNOx	16	**F**
SCR-DeNOx/automotive	17	**G**
Filter optimization	18	**H**
Process monitoring (high pressure)	20	**P**
Emission monitoring, certified according to 17th BImSchV and Mcerts, in combination with components C, D, E, F, M	22	**T**
Language (supplied documentation, software)		
German		**0**
English		**1**
French		**2**
Spanish		**3**
Italian		**4**

Selection and ordering Data

Further versions		Order code
Add "-Z" to Order No. and specify order code		
Telescopic rails (2 units)		**A31**
Set of Torx tools		**A32**
TAG labels (customized inscription)		**Y30**
Additional units		**Order No.**
External power supply, only for hybrid cable length > 500 m		**A5E00854188**
Calibration verification kit for NH_3 (version 2)	D)	**A5E01075594**
TÜV/MCERT calibration verification kit NH_3 (version 2), 2 cells	D)	**A5E00823339013**
TÜV/MCERT calibration verification kit NH_3/H_2O (version 2), 3 cells	D)	**A5E00823339014**
TÜV/MCERT calibration verification kit H_2O (version 2), 2 cells	D)	**A5E00823339015**
Calibration verification kit for NH_3 (version 1)	D)	**A5E00534675**
TÜV/MCERT calibration verification kit NH_3 (version 1), 2 cells	D)	**A5E00823339003**
TÜV/MCERT calibration verification kit NH_3/H_2O (version 1), 3 cells	D)	**A5E00823339004**
TÜV/MCERT calibration verification kit H_2O (version 1), 2 cells	D)	**A5E00823339005**
TÜV/MCERT calibration verification kit HCl, 2 cells		**A5E00823339008**
TÜV/MCERT calibration verification kit HCl/H_2O, 3 cells		**A5E00823339009**
Optical filter for reducing IR background radiation (flame filter)		**A5E00534668**

D) Subject to export regulations AL: 9I999, ECCN: N

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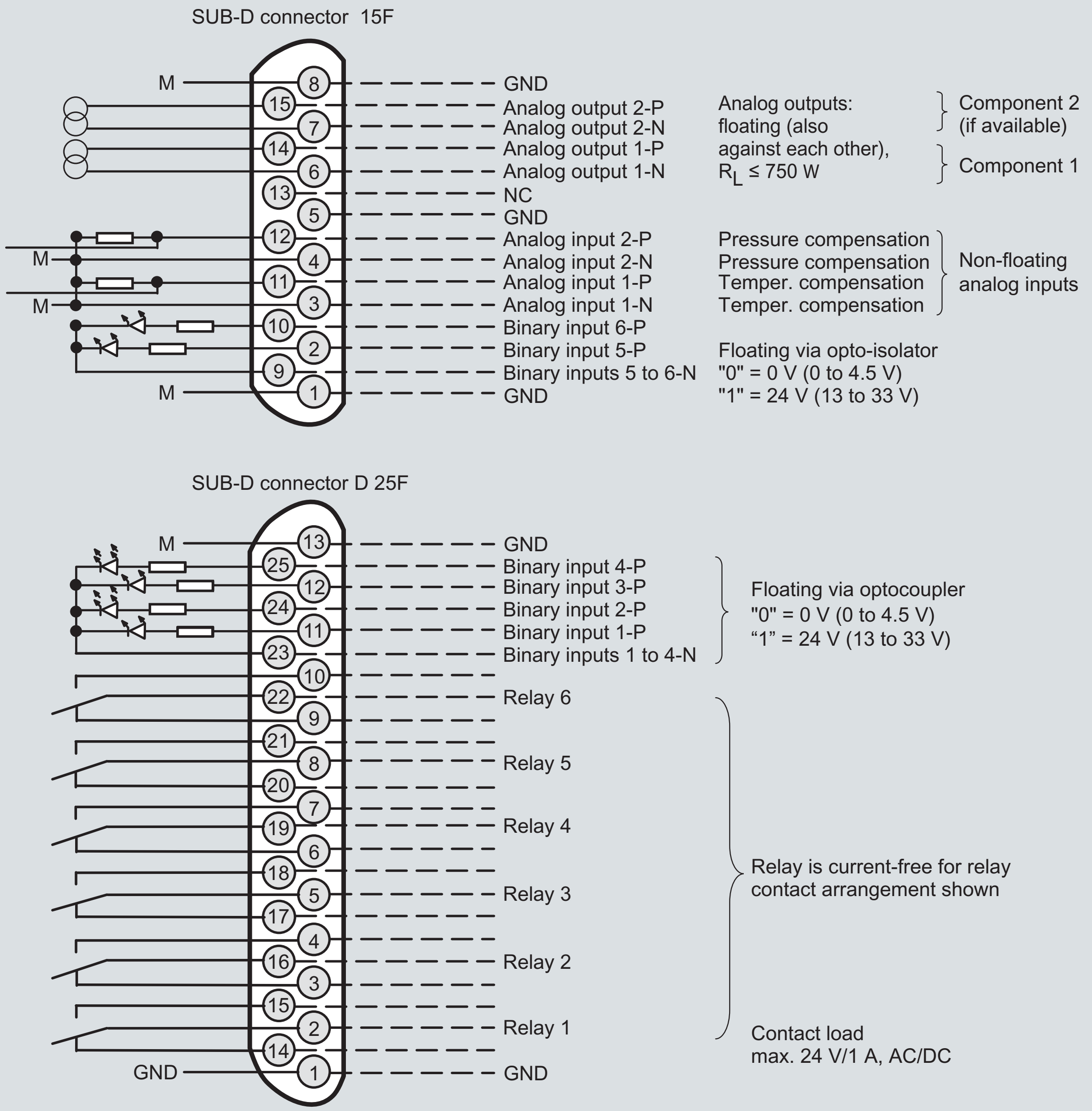
Documentation

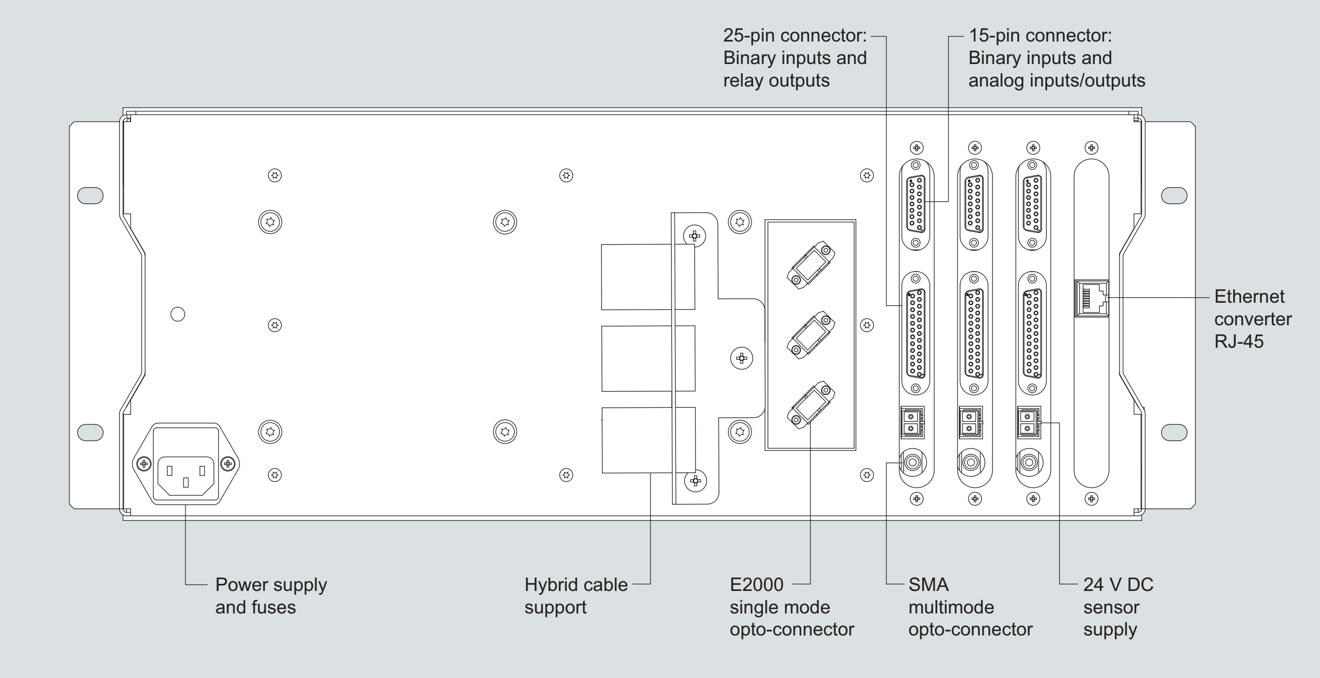
Schematics

Pin assignments



LDS 6, 19" central unit, pin assignments

Optical and electrical connections



LDS 6, three-channel 19" central unit, optical and electrical connections

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More information

The following table lists typical measuring conditions for standard applications. The values for resolution are only approximate. The exact resolution at the measuring point is determined by the sum of all influencing parameters and can be determined individually by Siemens. Please note that the detection limit values and maximum applicable range listed refer to a path length of 1 m. Longer path lengths will improve the detection limit, but not linearly. due to limiting effects such as dust load. The maximum applicable measuring ranges can only be used if permitted by the process conditions such as dust load.

				Standard application **Optical path length: 0.3 … 12 m** **Process gas pressure: 950 … 1 050 hPa** **Dust load[10] : < 50 g/Nm^3**	**Max. process gas temperature range** **T_{min} … T_{max}**	**Min. measuring range** **(usu. long optical path)**	**Max. measuring range** **(usu. short optical path)**	**(Detection limit x path length)** under standard conditions[1) 2)] without cross-interference of other gases	**(Detection limit x path length)** at 20 °C, 1 013 hPa with cross-interference of gas 2	**Accuracy[11)]**
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Remark**		**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**
O_2		A	A	Emission monitoring Flue gas	0 … 600 °C	0 … 5 vol.%	0 … 100 vol.%	0.1 vol.%/m	No cross-interference	2 %
			B	Combustion optimization High temperature calibration	600 … 1 200 °C	0 … 5 vol.%	0 … 100 vol.%	0.3 vol.%/m At 600 °C	No cross-interference	5 %
			C	Safety monitoring Short response time	0 … 600 °C	0 … 5 vol.%	0 … 100 vol.%	0.1 vol.%/m	No cross-interference	2 %
			D	Process monitoring Customized algorithm	0 … 600 °C	0 … 5 vol.%	0 … 100 vol.%	0.1 vol.%/m	No cross-interference	2 %
			P	Process monitoring - high process gas pressure (Process gas pressure: 950 … 5 000 hPa)	0 … 200 °C	0 … 5 vol.%	0 … 100 vol.%	0.1 vol.%/m	No cross-interference	2 %
O_2	**Temp**	B	B	Combustion optimization High temperature calibration	600 … 1 200 °C	0 … 5 vol.%	0 … 100 vol.%	0.7 vol.%/m	No cross-interference	5 %
NH_3		C	A	Emission monitoring Flue gas, high accuracy	0 … 150 °C	0 … 25 ppmv	0 … 500 ppmv[3)] 0 … 100 ppmv[4)]	0.5 ppmv/m	0.9 ppmv/m at 15 vol.% H_2O	2 %
			T	Emission monitoring Suitability-tested	0 … 150 °C	0 … 25 ppmv	0 … 500 ppmv[3)] 0 … 100 ppmv[4)]	0.5 ppmv/m	0.9 ppmv/m at 15 vol.% H_2O	2 %
			E	SCR-DeNOx High dynamics (e.g. waste incinerators)	250 … 350 °C	0 … 25 ppmv	0 … 500 ppmv[3)] 0 … 100 ppmv[4)]	0.9 ppmv/m At 250 °C	1.4 ppmv/m at 15 vol.% H_2O, 250 °C	2 %
			F	SCR-DeNOx Power plants	300 … 400 °C	0 … 25 ppmv	0 … 500 ppmv[3)] 0 … 100 ppmv[4)]	1 ppmv/m At 300 °C	1.5 ppmv/m at 15 vol.% H_2O, 300 °C	2 %
			G	SCR-DeNOx / automotive Engine test stands	20 … 650 °C[3)] 200 … 300 °C[4)]	0 … 25 ppmv	0 … 2 500 ppmv[3)] 0 … 100 ppmv[4)]	0.5 ppmv/m	1.5 ppmv/m at 15 vol.% H_2O, 300 °C	5 %

Footnotes see page 3/18

				Standard application **Optical path length: 0.3 … 12 m** **Process gas pressure: 950 … 1 050 hPa** **Dust load[10)]: < 50 g/Nm³**	**Min. measuring range** **(usu. long optical path)**	**Max. measuring range** **(usu. short optical path)**	**(Detection limit x path length)** under standard conditions[1)] [2)]	**(Detection limit x path length)** at 20 °C, 1013 hPa with cross-interference of gas 1	**Accuracy**[11)]	**Purging gas mode**		**Purging gas medium** **(on the process side + on the sensor side)**
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Remarks**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Standard**	**Optional**	
O_2		A	A	Emission monitoring Flue gas						D	B	N_2
			B	Combustion optimization High temperature calibration						E, F	G, H	Steam + air, N_2
			C	Safety monitoring Short response time						D	B	N_2
			D	Process monitoring Customized algorithm						D	B	N_2
			P	Process monitoring - high process gas pressure (Process gas pressure: 950 … 5 000 hPa)						D	B	N_2
O_2	**Temp**	B	B	Combustion optimization High temperature calibration		600 … 1 200 °C			[9)]	F	H	Steam + air, N_2
NH_3		C	A	Emission monitoring Flue gas, high accuracy						C	G	Air
			T	Emission monitoring Suitability-tested						C	G	Air
			E	SCR-DeNOx High dynamics (e.g. waste incinerators)						E	G	Air
			F	SCR-DeNOx Power plants						E	G	Air
			G	SCR-DeNOx / automotive Engine test stands						C	A	Air

Footnotes see page 3/19

Documentation

Gas 1	Gas 2	Gas code	Appl. code	**Standard application** **Optical path length: 0.3 … 12 m** **Process gas pressure: 950 … 1 050 hPa** **Dust load[10] : < 50 g/Nm^3**	**Max. process gas temperature range** T_{min} … T_{max}	**Min. measuring range** **(usu. long optical path)**	**Max. measuring range** **(usu. short optical path)**	**(Detection limit x path length)** under standard conditions[1, 2] without cross-interference of other gases	**(Detection limit x path length)** at 20 °C, 1 013 hPa with cross-interference of gas 2	**Accuracy[11]**
				Remark		**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**
NH_3	**H_2O**	D	A	Emission monitoring Flue gas	0 … 150 °C	0 … 25 ppmv	0 … 100 ppmv	0.5 ppmv/m	0.9 ppmv/m at 15 vol.% H_2O	2 %
			T	Emission monitoring Suitability-tested	0 … 150 °C	0 … 25 ppmv	0 … 100 ppmv	0.5 ppmv/m	0.9 ppmv/m at 15 vol.% H_2O	2 %
			E	SCR-DeNOx High dynamics (e.g. waste incinerators)	250 … 350 °C	0 … 25 ppmv	0 … 100 ppmv	0.9 ppmv/m At 250 °C	1.4 ppmv/m at 15 vol.% H_2O, 250 °C	2 %
			F	SCR-DeNOx Power plants	300 … 400 °C	0 … 25 ppmv	0 … 100 ppmv	1 ppmv/m At 300 °C	1.5 ppmv/m at 15 vol.% H_2O, 300 °C	2 %
			G	SCR-DeNOx / automotive Engine test stands	20 … 650 °C[3] 200 … 300 °C[4]	0 … 25 ppmv	0 … 100 ppmv	0.5 ppmv/m	1.5 ppmv/m at 15 vol.% H_2O, 300 °C	5 %
HCl		E	A	Emission monitoring Flue gas	0 … 150 °C	0 … 30 ppmv	0 … 6 000 ppmv[3] 0 … 100 ppmv[4]	0.6 ppmv/m	1.8 ppmv/m at 15 % H_2O, 20 °C	5 %
			T	Emission monitoring Suitability-tested	120 … 210 °C	0 … 30 ppmv	0 … 6 000 ppmv[3] 0 … 100 ppmv[4]	1.8 ppmv/m At 120 °C	4.5 ppmv/m at 15 vol.% H_2O, 120 °C	5 %
			H	Filter optimization High dynamics (e.g. waste incinerators)	150 … 250 °C	0 … 30 ppmv	0 … 6 000 ppmv[3] 0 … 100 ppmv[4]	1.0 ppmv/m At 150 °C	3.1 ppmv/m at 15 vol.% H_2O, 150 °C	5 %
HCl	**H_2O**	F	A	Emission monitoring Flue gas	0 … 150 °C	0 … 30 ppmv	0 … 100 ppmv	0.6 ppmv/m	1.8 ppmv/m at 15 % H_2O, 20 °C	5 %
			T	Emission monitoring Suitability-tested	120 … 210 °C	0 … 30 ppmv	0 … 100 ppmv	1.8 ppmv/m At 120 °C	4.5 ppmv/m at 15 vol.% H_2O, 120 °C	5 %
			H	Filter optimization High dynamics (e.g. waste incinerators)	150 … 250 °C	0 … 30 ppmv	0 … 100 ppmv	1.0 ppmv/m At 150 °C	3.1 ppmv/m at 15 vol.% H_2O, 150 °C	5 %
HF		G	A	Emission monitoring Flue gas	0 … 150 °C	0 … 5 ppmv	0 … 1 500 ppmv[3] 0 … 200 ppmv[4]	0.1 ppmv/m	0.6 ppmv/m at 15 vol.% H_2O, 20 °C	5 %
			H	Filter optimization High dynamics (e.g. waste incinerators)	150 … 250 °C	0 … 5 ppmv	0 … 1 500 ppmv[3] 0 … 200 ppmv[4]	0.11 ppmv/m At 150 °C	0.6 ppmv/m at 15 vol.% H_2O, 150 °C	5 %
HF	**H_2O**	H	A	Emission monitoring Flue gas	0 … 150 °C	0 … 5 ppmv	0 … 1 500 ppmv[3] 0 … 200 ppmv[4]	0.1 ppmv/m	0.6 ppmv/m at 15 vol.% H_2O, 20 °C	5 %
			H	Filter optimization High dynamics (e.g. waste incinerators)	150 … 250 °C	0 … 5 ppmv	0 … 1 500 ppmv[3] 0 … 200 ppmv[4]	0.11 ppmv/m At 150 °C	0.6 ppmv/m at 15 vol.% H_2O, 150 °C	5 %

Footnotes see page 3/18

				Standard application **Optical path length: 0.3 … 12 m** **Process gas pressure: 950 … 1 050 hPa** **Dust load[10] : < 50 g/Nm³**	**Min. measuring range** **(usu. long optical path)**	**Max. measuring range** **(usu. short optical path)**	**(Detection limit x path length)** under standard conditions[1) 2)]	**(Detection limit x path length)** at 20 °C, 1013 hPa with cross-interference of gas 1	**Accuracy** [11)]	**Purging gas mode**		**Purging gas medium** **(on the process side + on the sensor side)**
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Remarks**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Standard**	**Optional**	
NH_3	**H_2O**	D	A	Emission monitoring Flue gas	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m	0.1 vol.%/m	5 %	C	G	Air
			T	Emission monitoring Suitability-tested	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m	0.1 vol.%/m	5 %	C	G	Air
			E	SCR-DeNOx High dynamics (e.g. waste incinerators)	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m At 250 °C	0.1 vol.%/m At 250 °C	5 %	E	G	Air
			F	SCR-DeNOx Power plants	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m at 300 °C"	0.1 vol.%/m at 300 °C"	5 %	E	G	Air
			G	SCR-DeNOx / automotive Engine test stands	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m	0.1 vol.%/m	5 %	C	A	Air
HCl		E	A	Emission monitoring Flue gas						C	G	Air
			T	Emission monitoring Suitability-tested						C	G	Air
			H	Filter optimization High dynamics (e.g. waste incinerators)						E	G	Air
HCl	**H_2O**	F	A	Emission monitoring Flue gas	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m	0.1 vol.%/m	5 %	C	G	Air
			T	Emission monitoring Suitability-tested	0 … 5 vol.%	0 … 30 vol.%	0.6 vol.%/m At 200 °C	0.6 vol.%/m At 200 °C	5 %	C	G	Air
			H	Filter optimization High dynamics (e.g. waste incinerators)	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m At 150 °C	0.1 vol.%/m At 150 °C	5 %	E	G	Air
HF		G	A	Emission monitoring Flue gas						C	G	Air
			H	Filter optimization High dynamics (e.g. waste incinerators)						E	G	Air
HF	**H_2O**	H	A	Emission monitoring Flue gas	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m	0.1 vol.%/m	5 %	C	G	Air
			H	Filter optimization High dynamics (e.g. waste incinerators)	0 … 5 vol.%	0 … 30 vol.%	300 ppmv/m At 200 °C	300 ppmv/m At 200 °C	5 %	E	G	Air

Footnotes see page 3/19

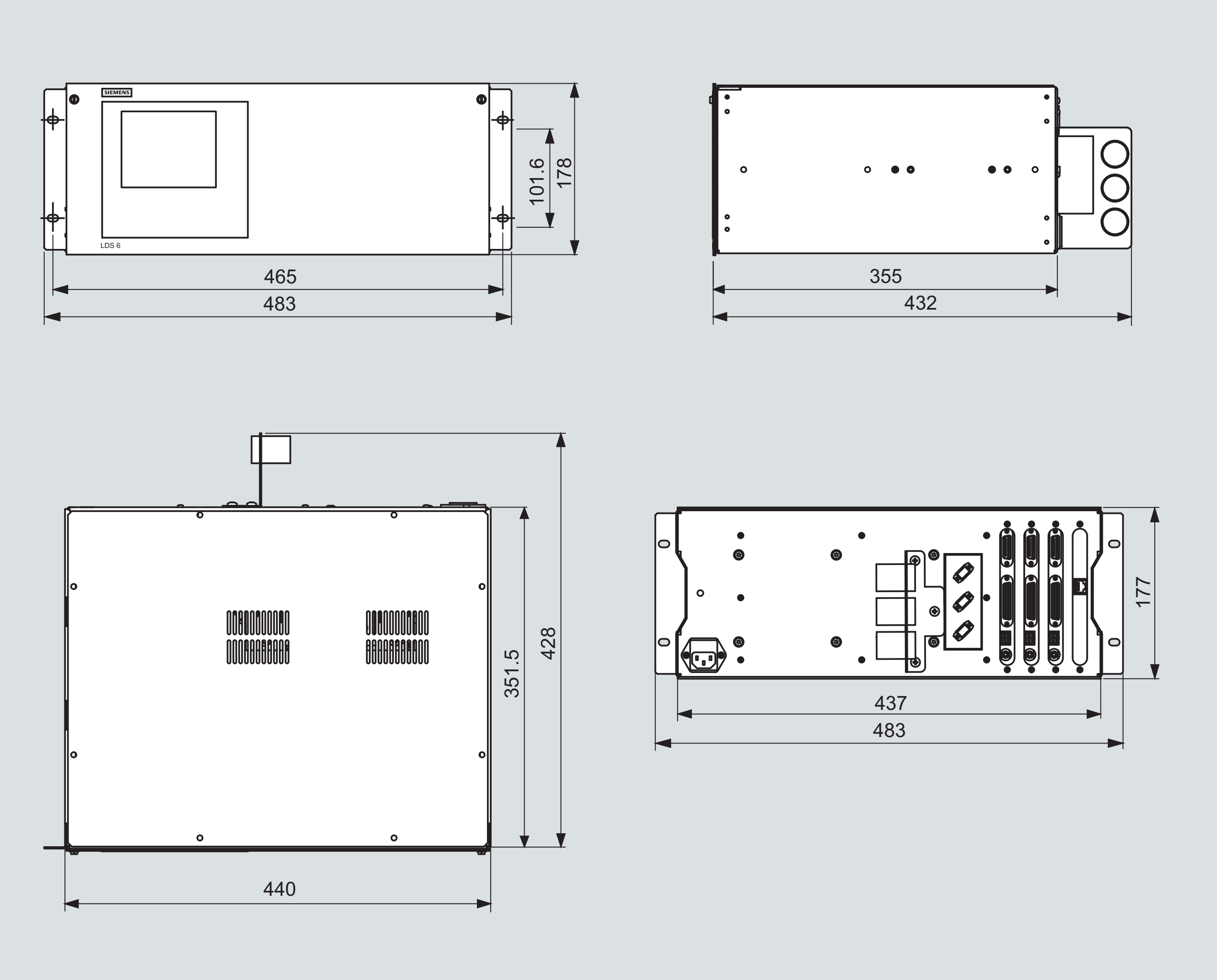
				Standard application Optical path length: 0.3 … 12 m Process gas pressure: 950 … 1 050 hPa Dust load[10] : < 50 g/Nm³	Max. process gas temperature range T_{min} … T_{max}	Min. measuring range (usu. long optical path)	Max. measuring range (usu. short optical path)	(Detection limit x path length) under standard conditions[1) 2)] without cross-interference of other gases	(Detection limit x path length) at 20 °C, 1 013 hPa with cross-interference of gas 2	Accuracy[11)]
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Remark**		**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**
CO		J	B	Combustion optimization	0 … 600 °C	0 … 1.5 vol.%[5)] 0 … 3.0 vol.%[6)]	0 … 100 vol.%	300 ppmv/m[5)] 600 ppmv/m[6)]	1 500 ppmv/m at 50 vol.% CO_2, 20 °C	2 %
			C	Safety monitoring Short response time	0 … 150 °C	0 … 1.5 vol.%[5)] 0 … 3.0 vol.%[6)]	0 … 100 vol.%	300 ppmv/m[5)] 600 ppmv/m[6)]	1 500 ppmv/m at 50 vol.% CO_2, 20 °C	2 %
			D	Process monitoring Customized algorithm	0 … 600 °C	0 … 1.5 vol.%[5)] 0 … 3.0 vol.%[6)]	0 … 100 vol.%	300 ppmv/m[5)] 600 ppmv/m[6)]	1 500 ppmv/m at 50 vol.% CO_2, 20 °C	2 %
CO	**CO_2**	K	D	Process monitoring Customized algorithm (Process gas pressure: 800 … 1 400 hPa)	0 … 400 °C	0 … 3.0 vol.%	0 … 100 vol.%	600 ppmv/m	7 000 ppmv/m at 50 vol.% CO_2, 20 °C	2 %
CO_2		L	A	Emission monitoring Flue gas	0 … 150 °C	0 … 7.5 vol.%	0 … 100 vol.%	1 500 ppmv/m[7)] 300 ppmv/m[8)]	7 000 ppmv/m at 50 vol.% CO, 20 °C	2 %
H_2O		M	A	Emission monitoring Flue gas	0 … 150 °C	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m		5 %
			T	Emission monitoring Suitability-tested	0 … 150 °C	0 … 5 vol.%	0 … 30 vol.%	0.1 vol.%/m		5 %

1) At 20 °C, 1 013 hPa
2) If T_{min} > 20 °C: at T_{min}, 1013 hPa
3) Without cross-interference of H_2O
4) With cross-interference of H_2O in the range 5 to 30 vol.%
5) Without cross-interference of CO_2
6) With cross-interference of CO_2 in the range 7.5 to 100 vol.%
7) Without cross-interference of CO
8) With cross-interference of CO in the range 3 to 100 vol.%, at 600 °C and at least 5 vol.% O_2 concentration: Resolution = 15 °C
9) At 1 000 °C and at least 5 vol.% O_2 concentration: Resolution = 25 °C
10) At 0.3 m optical path length, average diameter of the dust particles: 15 µm, specific weight of the dust particles: 650 kg/m³
11) With stable or externally measured and software-compensated process gas temperature and pressure conditions. At least: Detection limit

				Standard application Optical path length: 0.3 … 12 m Process gas pressure: 950 … 1 050 hPa Dust load[10] : < 50 g/Nm³	Min. measuring range (usu. long optical path)	Max. measuring range (usu. short optical path)	(Detection limit x path length) under standard conditions[1,2]	(Detection limit x path length) at 20 °C, 1013 hPa with cross-interference of gas 1	Accuracy[11]	Purging gas mode		Purging gas medium (on the process side + on the sensor side)
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Remarks**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Standard**	**Optional**	
CO		J	B	Combustion optimization						E	G	Air
			C	Safety monitoring Short response time						E	G	Air, N_2
			D	Process monitoring Customized algorithm						E	G	Air, N_2
CO	**CO_2**	K	D	Process monitoring Customized algorithm (Process gas pressure: 800 … 1 400 hPa)	0 … 5 vol.%	0 … 100 vol.%	1 500 ppmv/m	1 500 ppmv/m at 50 vol.% CO, 20 °C	2 %	C	G	Air
CO_2		L	A	Emission monitoring Flue gas						C	G	Air
H_2O		M	A	Emission monitoring Flue gas						C	G	Air
			T	Emission monitoring Suitability-tested						C	G	Air

1) At 20 °C, 1 013 hPa
2) If T_{min} > 20 °C: at T_{min}, 1013 hPa
3) Without cross-interference of H_2O
4) With cross-interference of H_2O in the range 5 to 30 vol.%
5) Without cross-interference of CO_2
6) With cross-interference of CO_2 in the range 7.5 to 100 vol.%
7) Without cross-interference of CO
8) With cross-interference of CO in the range 3 to 100 vol.%
9) At 600 °C and at least 5 vol.% O_2 concentration: Resolution = 15 °C, at 1 000 °C and at least 5 vol.% O_2 concentration: Resolution = 25 °C
10) At 0.3 m optical path length, average diameter of the dust particles: 15 µm, specific weight of the dust particles: 650 kg/m³
11) With stable or externally measured and software-compensated process gas temperature and pressure conditions. At least: Detection limit

Dimensional drawings



LDS 6, 19" central unit, dimensions in mm

Overview

Cross-duct sensors CD 6 and cables for non-Ex applications

The standard cross-duct sensor consists of a transmitter unit and a receiver unit with the same dimensions. The transmitter unit provides a connector for the fiber-optic cable. The laser light is transmitted through this cable. The receiver unit contains a photodetector and an electronics PCB, and is connected to the transmitter unit by a sensor cable.

The sensors are mounted onto flanges. The easiest way to avoid condensation and dust deposits on the sensor windows is to purge them, e.g. with instrument air. 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 with standard applications.

If a component is to be measured which is also present in measurable quantities in the purging medium - such as oxygen or moisture - it is necessary to use purging gases such as nitrogen, superheated process steam or similar. In such cases it is usually also necessary to purge 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.

Note: For measurement of O_2 at gas temperatures above 600 °C, it may also be possible to tolerate air as the purging medium since its influence on the measurement can be compensated. In contrast to this, the combination O_2/temperature always requires O_2-free purging.

Applications with oxygen (high-pressure)

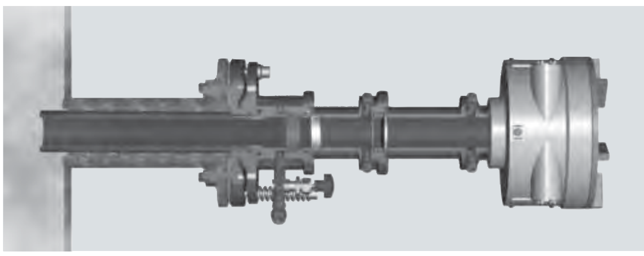
For oxygen measurements with a higher process gas pressure (1 to 5 bar), the sensor CD 6 can be used together with a suitable window flange as process connection. This window flange is also available in the standard sizes DN 65/PN 6, DN 80/PN 16 or ANSI 4"/150 lbs. The optical surface to the process is made of borosilicate glass. Flanges can be equipped with window purging, but without purging tubes. Possible purge modes for the window flanges are "A-C" (no purging or moderate purging on the process side). Window flanges are tested for leakage before delivery using overpressure, and show leakage rates of less than 10^{-5} mbar·l/s.

For ordering this application, the MLFB code of the central unit with the application code "P" must be selected. The process interface suitable for the sensors can be chosen by selection of the corresponding code in the 6th configurable position of the MLFB number.

The most important sensor purging configurations are presented below:

Purging with moderate flow

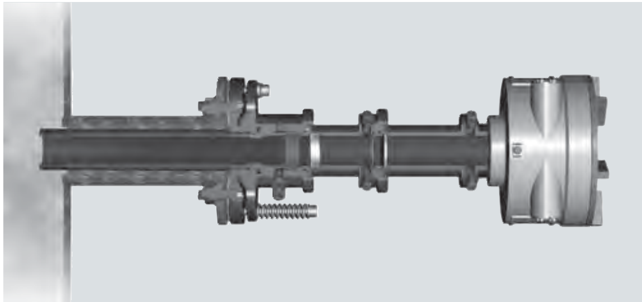
Is selected for pure gas applications, such as emission monitoring, inerting monitoring, ... The purging gas flow can be adjusted between 0 and approx. 120 l/min at each sensor head using a needle valve (included in delivery).



Moderate purging on process side

Purging with increased flow

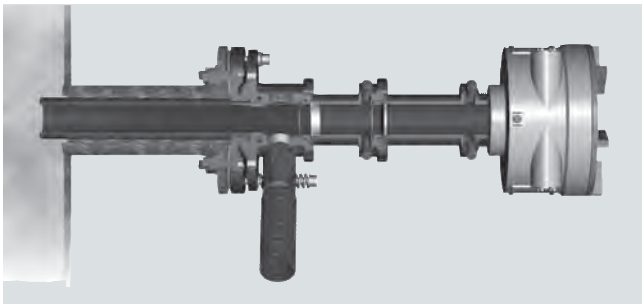
Through omission of needle valve. This type of purging is selected in crude gas applications with higher concentrations of particles and/or condensation such as in non-purified flue gases in combustion plants, ... The purging gas flow is typically set between 200 and 500 l/min on each sensor head depending on the input pressure of the purging medium.



Increased purging on process side

Purging with high flow

Through use of air blower or dry process steam. Connectors with hose adapters are included in the delivery. An additional Swagelok adapter must be ordered if a high flow of steam or instrument air purging is required (option A27). This type of purging is selected in crude gas applications with very high concentrations of particles and/or condensation such as in the furnaces of combustion plants. If instrument air is not available, an air blower is also an alternative for purging in applications with lower demands. On the process side, dry steam can be used as the inert purging gas instead of nitrogen. The purging gas flow is automatically set between 500 and < 1 000 l/min on each sensor head depending on the purging air blower or the steam pressure.



Increased purging on process side, with hose connection adapter

Purging on sensor side

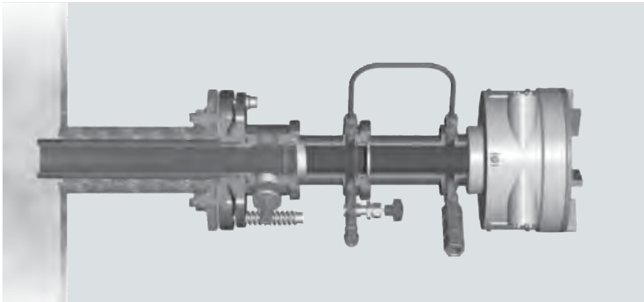
Can be combined with any purging mode on the process side, and is always selected if the ambient air must never have an influence on the measurement. The volumes within the sensor head are then continuously purged with an O_2-free gas. Allowed purging gases are nitrogen or carbon dioxide. The flow of purging gas required in this case is approx. 1 to 6 l/min and is set using a needle valve (included in delivery). The combination shown here of purging with superheated process steam on the process side and with nitrogen from a compressed gas bottle on the sensor side may satisfy the necessity for O_2-free purging e.g. also in combustion plants with boilers without own nitrogen network.

3

Cross-duct sensor CD 6

Note

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. This applies especially in the case of cascaded process and sensor purging where there is otherwise the danger that, for example, corrosive process gases could enter the sensor enclosure.



Sensor configuration with high purging on process side, with 6 mm joint for use with steam, and with N_2 purging on the sensor side

The purging media used on the process side flow through purging gas tubes into the process gas stream. The tubes extend a few centimeters into the process area, and usually provide a flow from the side. This results in a wedge being generated in the inlet zone of the purging gas. The effective measuring path in the process gas is therefore well-defined as the distance between the ends of the two purging gas inlet tubes.

Cross-duct sensor CD 6: Options and accessories

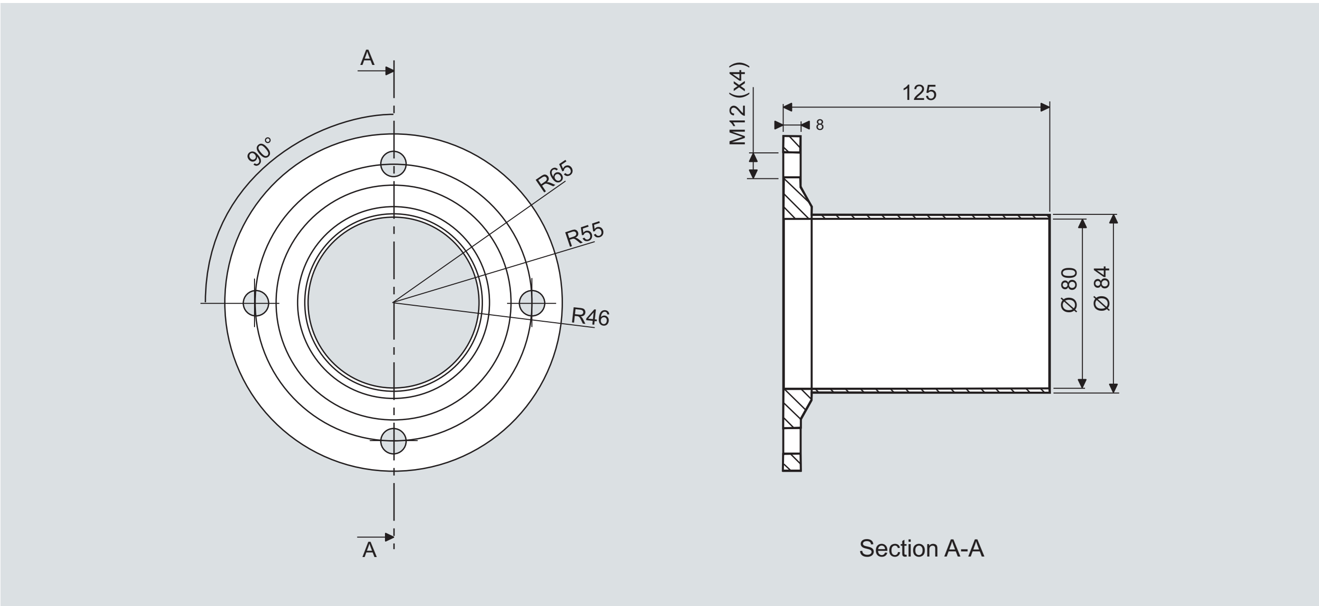
Sensor alignment kit

Includes a battery-operated visible light source, a centering aid with crosshair, and two hook spanners for opening the optics tube of the sensors.

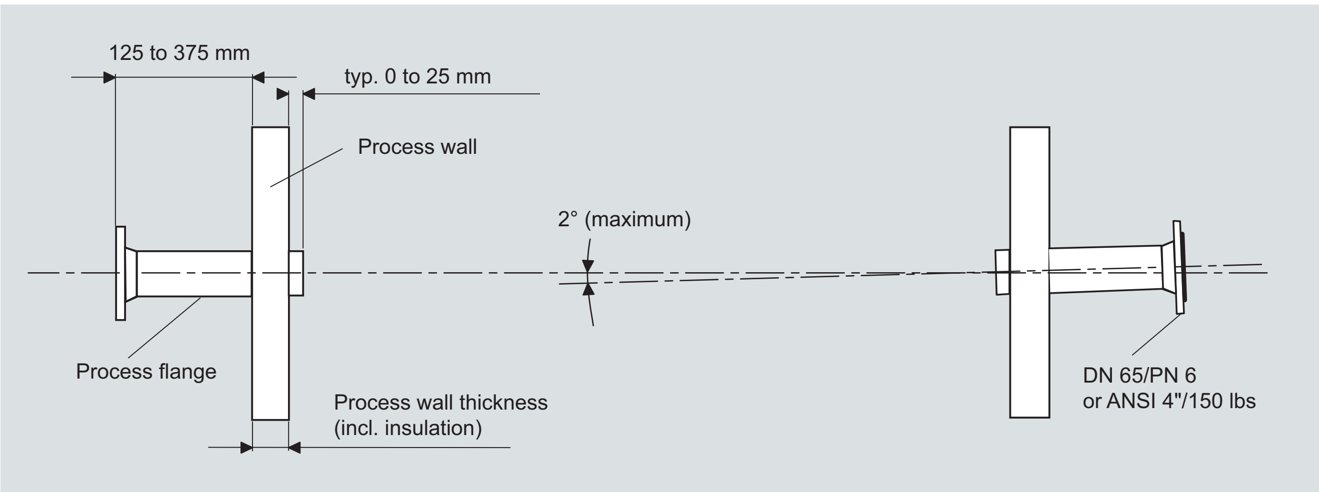
Please note: the sensor alignment kit is not explosion protected.

Welding flanges

2 special flanges made of stainless steel with DN 65 circle of holes for use as mounting flange on process side. Particularly suitable together with the sensor configurations for the SCR-DeNOx/automotive application.



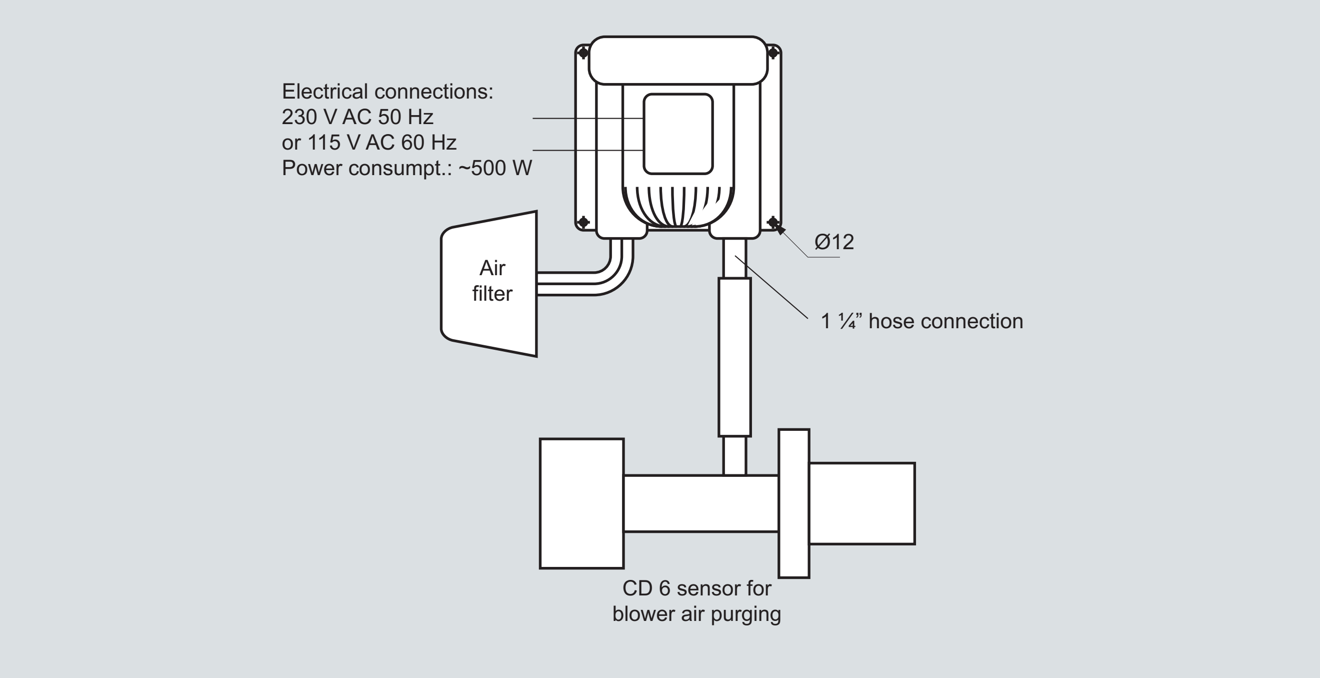
Weld-on flange, sensor option, dimensions in mm



Installation requirements for the cross-duct sensors CD 6, dimensions in mm

Purging air blower

Two purging air blowers are required to purge the sensor heads. Both 230 V AC and 115 V AC versions can be ordered.



Sensor configuration with purging air blower

Flow cell (available on special application)

For implementation of measuring configurations with bypass mode. The cell consists of a stainless steel tube whose internal surfaces are coated with PTFE to minimize surface effects. With an effective measuring path of 1 m, the inner volume is only 1.2 l, and fast gas displacement times can therefore be achieved. The flow of sample gas can be from the ends or from the center of the tube, since appropriate 6 mm joints are present here. The flow cell can be ordered in four configurations:

- Unheated, including assembly for wall mounting
- Unheated, including assembly for wall mounting and a 19" housing with an air jet pump with a delivery rate of max. 30 l/min
- As above, but can be heated up to approx. 200 °C
- As above, but can be heated up to approx 200 °C and mounted on a rack with wheels and integrated 19" frame

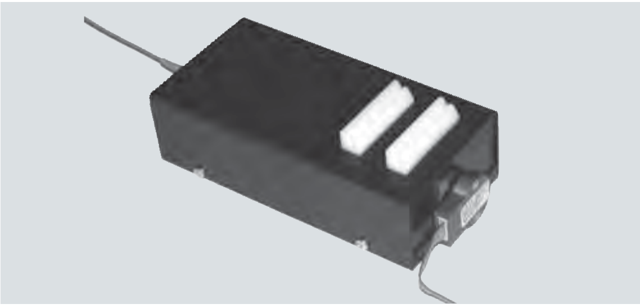
Optical bandpass filter

Serves to protect the light-sensitive detector in the receiver unit of the sensor from saturation by IR background radiation. Is used with measurements in very hot process gases (T > 1000 °C) or with unavoidable appearances of flames in the measurement path.

Verification of calibration

Assembly with certified, maintenance-free calibration gas cell with connections for laser fiber-optic conductors and detector module of cross-duct sensor. Serves to rapidly verify the factory calibration in the field without compressed gas bottles and flow cell.

The calibration verification kit is available for applications in which ammonia is the sample gas.



Assembly for verification of calibration

3

Technical specifications

Cross-duct sensor CD 6

General	
Design	Transmitter and receiver units, connected by a sensor cable
Materials	Stainless steel
Installation	Horizontally to the optical axis, perpendicular or parallel to the gas flow
Laser protection class	Class 1, safe to the eye
Explosion protection	Optional, in accordance with ATEX II 1 G Ex ia IIC T4, ATEX II 1 D IP65 T135°C
	A defined leak rate can only be guaranteed when using high-pressure window flanges. Otherwise it may be necessary for the owner to carry out an evaluation in accordance with ATEX (DEMKO 06 ATEX 139648X [17]).
Design, enclosure	
Degree of protection	IP65
Dimensions	Diameter: 163, L: 395 mm
Purging gas tube in mm	400 (370 net) x 44 x 40
	800 (770 net) x 44 x 40
	1 200 (1 170 net) x 44 x 40
Weight	2 x approx. 11 kg
Mounting	DN 65/PN 6 or ANSI 4"/150

Please note:
- For purging tubes with a length of 800 and 1 200 mm, the wall thickness must not exceed 200 mm with DN 65/PN 6 connections. To carry out measurements with thicker walls, please contact Siemens.
- The optimum adjustment of the flanges can change with high differences in temperature depending on the type of assembly.

Electrical characteristics	
Power supply	24 V DC, supply from central unit via hybrid cable
Power consumption	< 2 W during operation
Climatic conditions	
Ambient temperature	-30 ... +70 °C during operation,
	-40 ... +70 °C during storage and transportation
Humidity	< 95 % RH, above dew point
Pressure	800 ... 1 100 hPa
Temperature range on the sensor side of the process interface (connection plate)	-20 … +70 °C
Measuring conditions	
Measurement path	0.3 m ... 12 m (other lengths on request)
Gas temperatures	0 ... 1 200 °C, application-dependent
Gas pressure	General: 1 013 ± 50 hPa
	CO/CO_2: 800 … 1 400 hPa
	High pressure O_2: 950 ... 5 000 hPa
Dust load	The influence of dust is very complex and depends on the path length and particle size. The optical damping increases exponentially at longer path lengths. Smaller particles also have a 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.

Accessories

Purging

Nitrogen is permissible as the purging gas for the sensor side. Nitrogen, steam, air and gases which are not subject to the pressure equipment directive Cat. 2 are permissible as purging gases for the process side.

Purging with instrument air, N_2	
• Pressure at purging inlet	2 000 ... 8 000 hPa
• Max. overpressure in the sensor	< 500 hPa
• Quality	
- Instrument air	Free of oil and water
- Nitrogen	Purity better than 99.7 %. For oxygen measurements, an O_2 content < 0.01 % is recommended in the purging gas (optical path length ≥ 1 m, min. 5 % oxygen in the process gas)
• Maximum flow rate	500 l/min
• Dew point	Benchmark: < -10 °C, condensation on the optics must be avoided
Blower purging	
• Maximum counter pressure	40 hPa
• Maximum flow rate	850 l/min
• Power consumption	370 W
• Degree of protection (fan)	IP54
Steam purging	
• Steam conditioning	Overheated
• Maximum temperature	240 °C
• Minimum pressure	> 4 000 hPa
• Maximum pressure	16 000 hPa, refers to a volume flow of approx. 1 100 l/min

Hybrid and sensor cables

General	
Configuration hybrid cable	Two optical fibers and two twisted copper wires in one cable for 24 V DC. Single-mode optical fiber configured at both ends with E2000 angle connectors. Multimode optical fiber configured at both ends with SMA connectors.
Cable sheath	Oil-resistant polyurethane
Dimensions	Diameter: < 8 mm, length: up to 700 m
	• For > 500 m, an external power supply must be additionally ordered
	• For installation in hazardous zones, non-intrinsically-safe cables have to be spatially separated from intrinsically-safe lines
Impact resistance	200 N/cm
Maximum tensile strength	500 N
Minimum bending radius	10 cm
Climatic conditions	
Ambient temperature	-40 ... +80 °C during operation
Humidity	< 95 % rel. humidity, above dew point (in operation and storage)

Selection and ordering Data

Selection and ordering Data		Order No.
LDS 6 in-situ gas analyzer Pair of sensors (cross-duct sensor)		**7MB6122-** ■■■■■ - ■■■■
Explosion protection		
Without		0
In accordance with ATEX II 1 G Ex ia IIC T4, ATEX II 1 D IP65 T135°C		1
Sensor type	**Measuring element**	
Standard cross-duct sensor	O_2	A
	All gases except O_2	W
Purging, process side	**Sensor side**	
Without purging	Without purging	A
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	B
Instrument air or N_2 Reduced flow: 0 ... 120 l/min incl. needle valve, 6 mm Swagelok	Without purging	C
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	D
Air or N_2 Increased flow: 200 ... 500 l/min incl. 6 mm Swagelok	Without purging	E
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	F
Air, fan or steam; high flow: > 500 l/min incl. 1¼" hose adapter	Without purging	G
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	H
Purging tubes, material		
No purging tubes		0
Stainless steel, EN 1.4432/316L		1
Purging tubes, length		
No purging tubes		0
400 mm		1
800 mm		2
1 200 mm		3
Engine test rig		4
Special length		9
Process connection		
Stainless steel flange (EN 1.4404/316L), dimensions acc. to DN 65/PN 6		0
Stainless steel flange (EN 1.4404/316L), dimensions acc. to ANSI 4"/150 lbs		1
Stainless steel flange (EN 1.4404/316L) for engine test rig		2
Pressure-resistant window flange (EN 1.4404/316L, borosilicate glass), DN 65/PN 6		3
Pressure-resistant window flange (EN 1.4404/316L, borosilicate glass), DN 80/PN 16		4
Pressure-resistant window flange (EN 1.4404/316L, borosilicate glass), ANSI 4"/150 lbs		5
Hybrid cable	**Length [m]**	
No hybrid cable		X
Standard length	5	A
	10	B
	25	E
	40	G
	50	H
Customized length	Only > 50	Z

Documentation

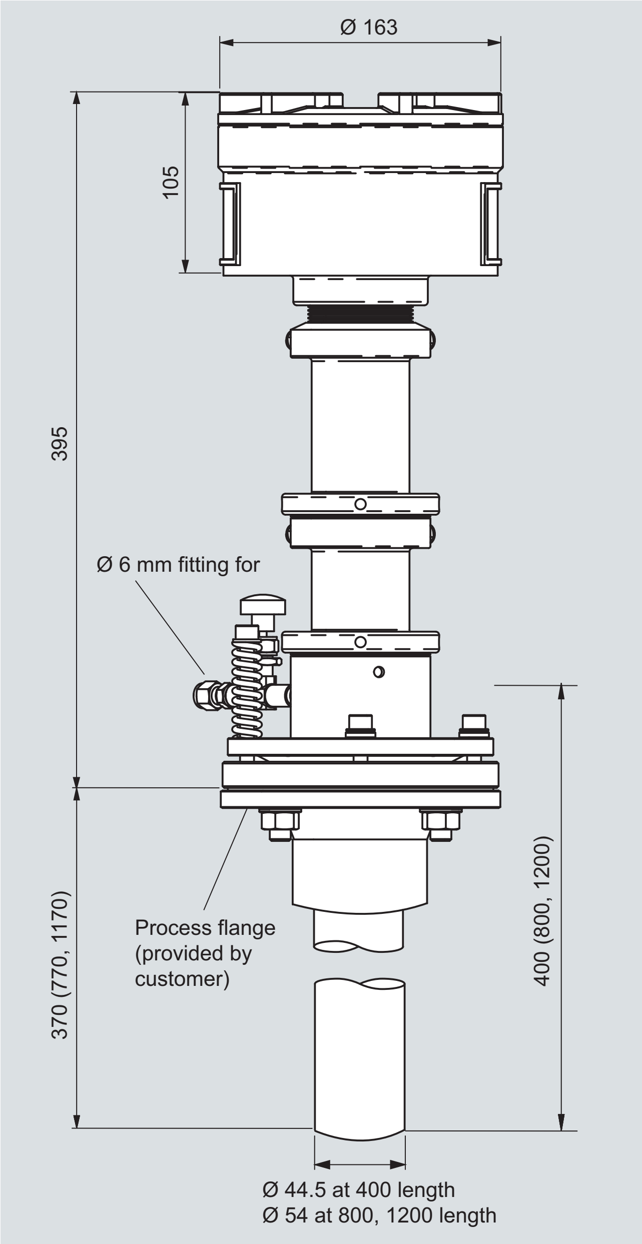
Selection and ordering Data		Order No.
LDS 6 in-situ gas analyzer Pair of sensors (cross-duct sensor)		7MB6122- ■■■■■ - ■■■■
Sensor connecting cable	**Length [m]**	
No sensor connecting cable		X
Standard length	5	A
	10	B
	25	E
Customized length	Only > 25	Z
Language (supplied documentation)		
German		0
English		1
French		2
Spanish		3
Italian		4

3

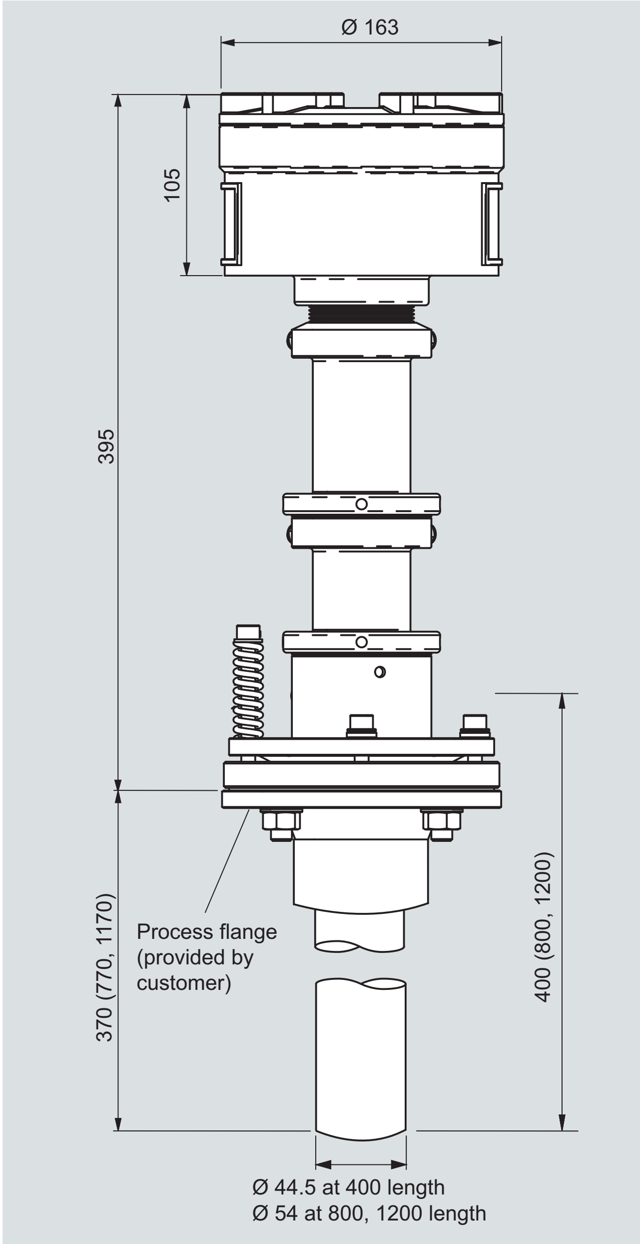
Selection and ordering Data		
Further versions		**Order code**
Add "-Z" to Order No. and specify order code		
6 mm Swagelok adapter for purging with steam, purging modes G and H		**A27**
Purging tube, special length		**M1Y**
Hybrid cable, customized length		**P1Y**
Sensor cable, customized length		**Q1Y**
TAG label, customized inscription		**Y30**
Additional units		**Order No.**
Purging air blower 230 V	D)	**A5E00829151**
Purging air blower 115 V		**A5E00829150**
CD 6, sensor alignment kit		**A5E00253142**

D) Subject to export regulations AL: 9I999, ECCN: N

Dimensional drawings

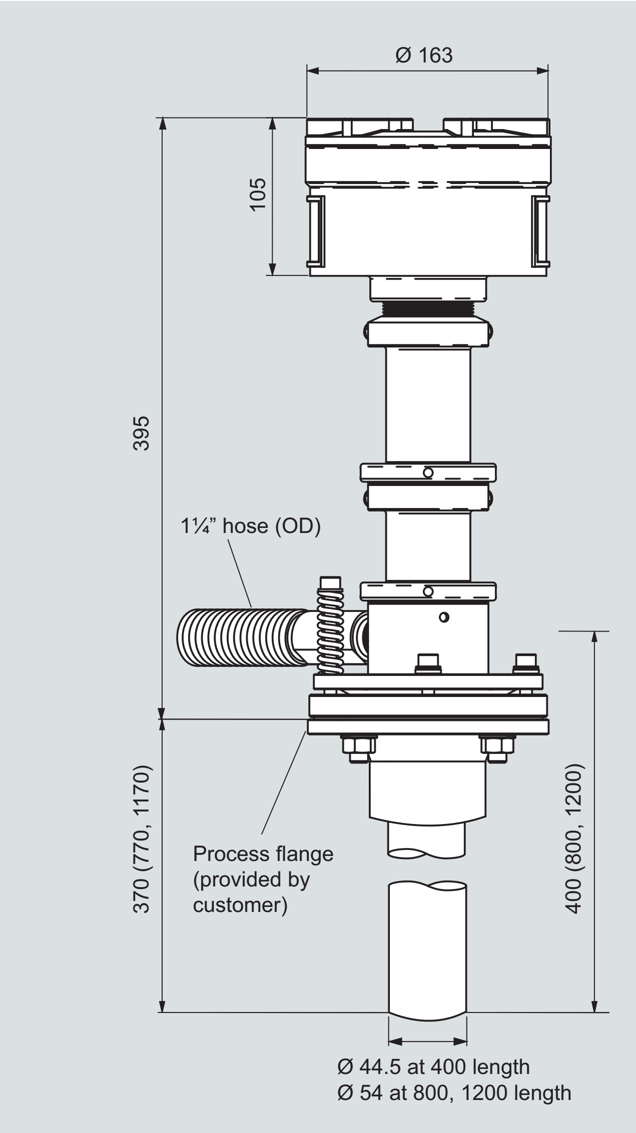


Cross-duct sensor CD 6, moderate purging (instrument air), version according to Order No. 7MB6122-**C1*-0***, dimensions in mm

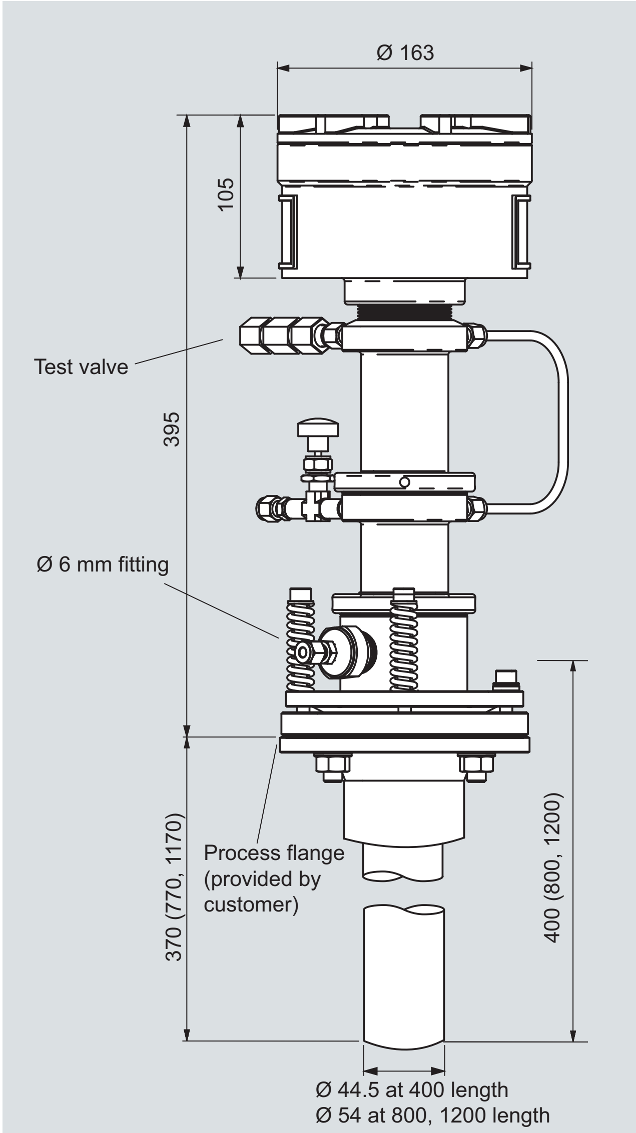


Cross-duct sensor CD 6, increased purging (instrument air), version according to Order No. 7MB6122-**E1*-0***, dimensions in mm

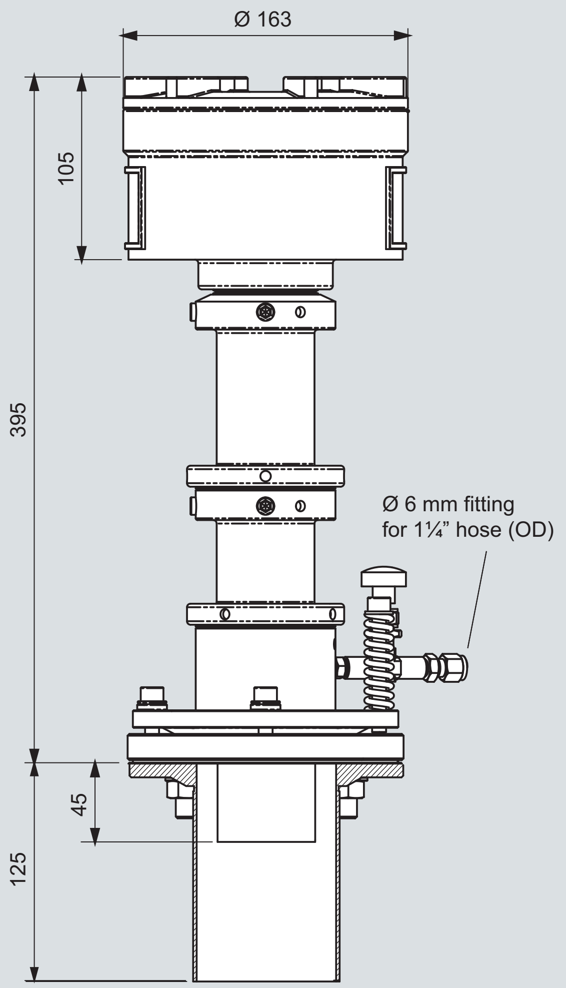
Documentation



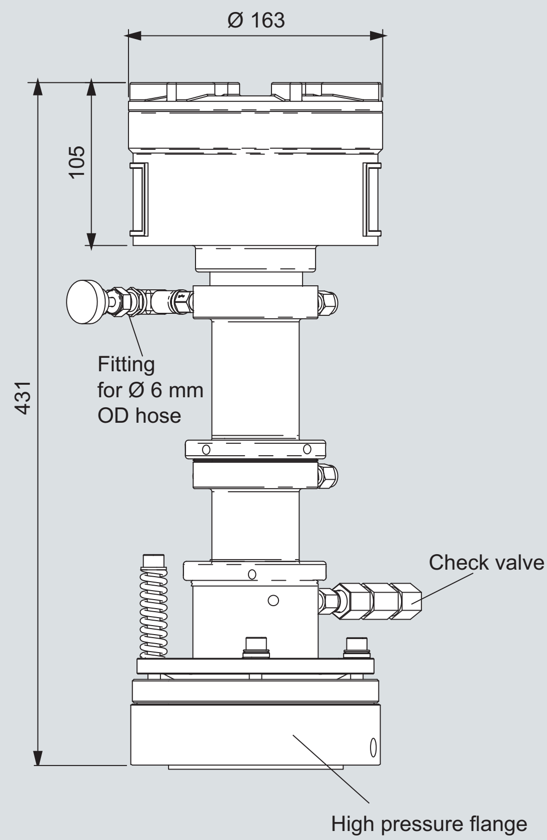
Cross-duct sensor CD 6, blower purging, version according to Order No. 7MB6122-**G1*-0***, dimensions in mm



Cross-duct sensor CD 6, sensor and process side purging, version according to Order No. 7MB6122-**H1*-0***, dimensions in mm



Cross-duct sensor CD 6, purged version for application SCR_DeNOx/automotive, version according to Order No. 7MB6122-*WC14-2***, dimensions in mm



CD 6 high-pressure sensor for oxygen, dimensions in mm

Documentation

Selection and ordering Data

Manual	Order No.
LDS 6 manual	
• German	**A5E00295893**
• English	**A5E00295894**
• French	**A5E00295895**
• Italian	**A5E00295896**
• Spanish	**A5E00362720**

Suggestions for spare parts

Selection and ordering Data

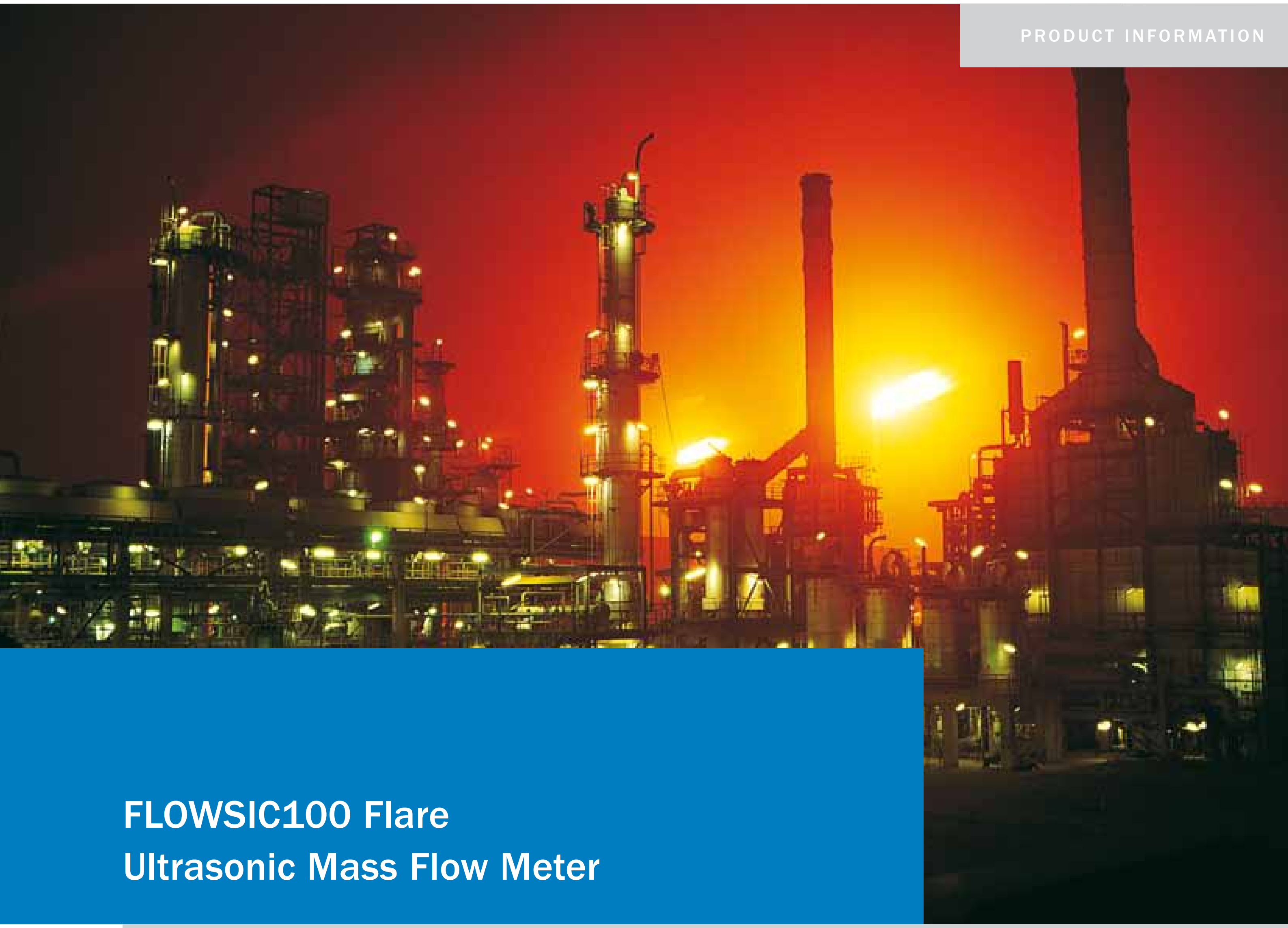
Description	Quantity for 2 years	Quantity for 5 years		Order No.
CD 6, window module, quartz	1	2		**A5E00338487**
CD 6, window module, engine test rig, no purging	1	2		**A5E00338490**
CD 6, high-pressure window for SS 2343 DN 65/PN 6	1	2		**A5E00534662**
CD 6, high-pressure window for SS 2343 DN 80/PN 16	1	2		**A5E00534663**
CD 6, high-pressure window for SS 2343 ANSI 4"	1	2		**A5E00534664**
CD 6, Roctex gasket for sensor	1	2	D)	**A5E00853911**
CD 6C, high-pressure window DN 80/PN 16	1	2		**A5E00534671**
CD 6, sensor electronics FO InGaAs (version 2)	1	1		**A5E01090409**
CD 6, sensor electronics FO Ge, only HCl (version 2)	1	1		**A5E01090413**
CD 6, sensor electronics SW, only O_2	1	1		**A5E00338533**
CD 6, sensor electronics ATEX SW, only O_2	1	1		**A5E00338563**
CD 6, sensor electronics ATEX HCl	1	1		**A5E00853896**
CD 6, sensor electronics ATEX HF	1	1		**A5E00853905**
CD 6, sensor electronics ATEX NH_3, CO, CO_2	1	1		**A5E00338572**

D) Subject to export regulations AL: 9I999, ECCN: N

More information

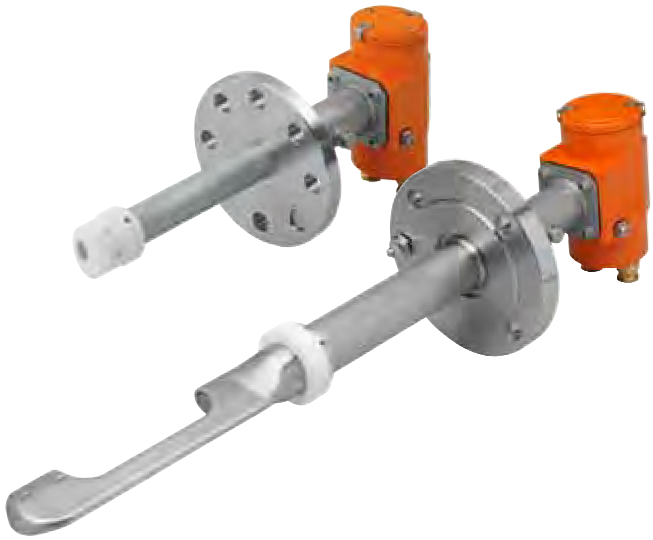
LDS 6 does not contain parts subject to wear, but some parts within the sensors might be stressed. For this reason it is recommended for demanding applications to keep window modules and detector electronics on stock (quantities stated per measuring point, i.e. per sensor pair).

For the suitability of different parts (version 1 or version 2) please consult the instrument manual or contact Siemens directly. In general, all new analyzers are compatible with spare parts of version 2.



FLOWSIC100 Flare
Ultrasonic Mass Flow Meter

Gas Mass Flow Measurement for
Flare Gas Applications



SICK
Sensor Intelligence.

FLOWSIC100 Flare –
The reliable mass flow measurement for flare and vent gas applications

AREAS OF APPLICATION

- CO_2 emission monitoring for compliance with government regulations
- Valve leakage detection and gas identification
- Optimization of steam usage in flare gas systems
- Gas waste reduction
- Accurate mass balance calculations and process optimization

FLOWSIC100 EX-S

- Cross-duct high speed version (patent pending)
- 90° nozzle installation
- Optional: retractable under process conditions
- Hermetically sealed stainless steel and titanium probes
- ATEX and CSA approved for use in hazardous areas

FLOWSIC100 EX/EX-RE

- Cross-duct high power version for use in large ducts and for signal dampening gases
- Optional: retractable under process conditions
- Hermetically sealed stainless steel and titanium probes
- ATEX and CSA approved for use in hazardous areas

FLOWSIC100 EX-PR

- High speed probe version (patent pending)
- Single flange installation
- Optional: retractable under process conditions
- Hermetically sealed stainless steel and titanium probes
- ATEX and CSA approved for use in hazardous areas

KEY FEATURES

- Operation under very high gas velocities using an innovative high speed sensor design
- Accurate operation at low flow (near zero)
- Easy installation steps - welding of nozzles perpendicular to pipeline
- Remote installation of control unit up to 3,280 ft (1,000 m) (serial interconnection)
- Single flange installation using probe version FLOWSIC100 EX-PR
- Improved accuracy - spool piece solution
- Reliable device function - automatic self diagnosis

FLOWSIC100 EX-S Retractable (measuring position)

FLOWSIC100 EX-PR

SYSTEM COMPONENTS

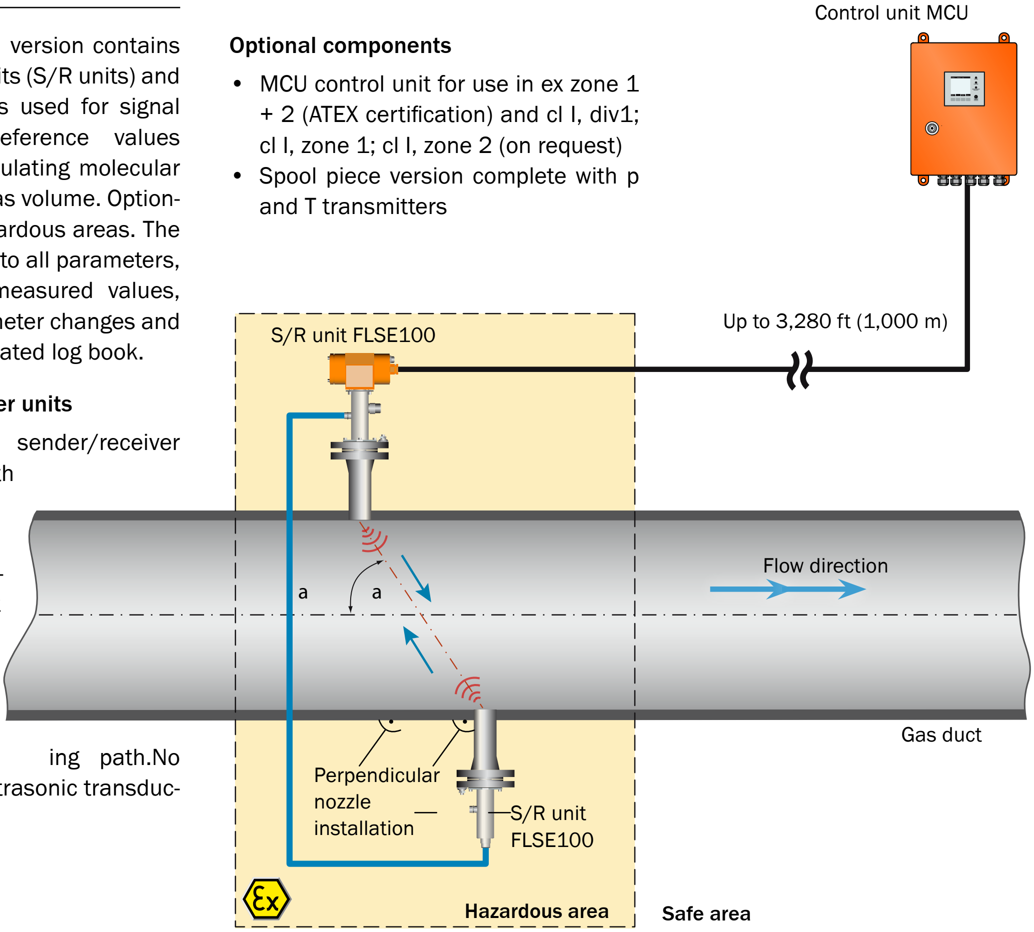
The FLOWSIC100 Flare standard version contains two FLSE100 sender/receiver units (S/R units) and a MCU control unit. The MCU is used for signal inputs/outputs, determining reference values (standardization) as well as calculating molecular weight, mass flow or storage of gas volume. Optionally the MCU is applicable in hazardous areas. The SOPAS software provides access to all parameters, contains graphical display of measured values, trend curves and stores all parameter changes and measurement events in an integrated log book.

Installation of the sender/receiver units

- Cross-duct installation: two sender/receiver units are mounted on both sides of a duct – rectangular to the gas flow direction.
- One-side installation: one single sender/receiver unit (probe type) is mounted at a specific angle to the gas flow. Both ultrasonic transducers are installed on the probe with a fixed measuring path. No specific alignment between ultrasonic transducers needed.

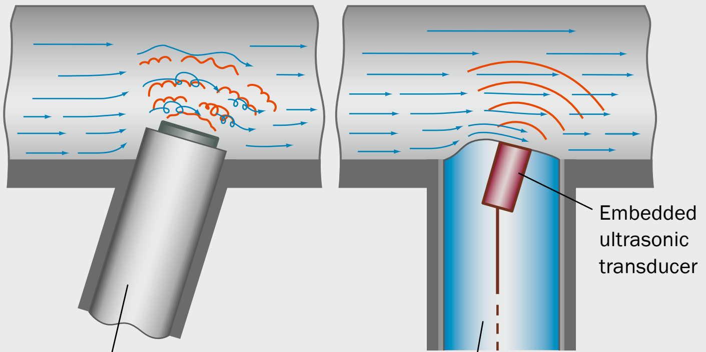
Optional components

- MCU control unit for use in ex zone 1 + 2 (ATEX certification) and cl I, div1; cl I, zone 1; cl I, zone 2 (on request)
- Spool piece version complete with p and T transmitters



UNIQUE HIGH SPEED SENSOR DESIGN (PATENT PENDING)

An innovative sensor design was developed for the FLOWSIC100 Flare. The ultrasonic transducer is embedded in a flow optimized sensor shape – suitable for high speed gas flow conditions. The unique design reduces flow noise and signal drift to a minimum and enables stable and reliable measurement results at very high gas velocities. A new 2-stage signal algorithm ensures best signal processing under low flow as well as high flow conditions.



8011249/2009-06 · DIV03/KE · Printed in USA (2009-06) · Subject to modifications.

Technical Data	FLOWSIC100 Flare		
Version	**EX-S**	**EX/EX-RE**	**EX-PR**
Measuring parameter			
Measuring principle	Ultrasonic transit time measurement method		
Measuring values	Mass flow, standard and actual volumetric flow, molecular weight, totalized standard volume and mass, gas velocity, gas temperature, speed of sound		
Measuring range [1]	0.098...394 ft/s (0.03...120 m/s)		
Accuracy [2]	1-path measurement: ±1.5 ... 5 %/0.5 ... 2.5 % [3]; 2-path measurement: 1.0 ... 3.0 %/0.5 ... 1.5 % [3]		
Accuracy of molecular weight [4]	< 2% of measurement range, 2 ... 120 kg/kmol (non-carbon hydrogens < 10 vol %)		
Accuracy of mass flow [4]	1-path measurement: ±2.5 ... 5% of meas. range; 2-path measurement ±2 ... 4% of meas. range		
Resolution	0.04 in/s (0.001 m/s)		
Repeatability	0.2 % at 33 ft/s (10 m/s)		
Rangeability	up to 4000:1		
Inner duct diameter	≥ 4...71 in (≥ 0.1...1.8 m)		≥ 12...71 in (≥ 0.3...1.8 m)
Measurement conditions			
Gas temperature	• Standard range: −94...+356 °F (−70...+180 °C) • High temperature range zone 1: −94...+536 °F (−70...+280 °C) zone 2: −94...+500 °F (−70...+260 °C) • Low temperature range [6]: −328...+212 °F (−200...+100 °C)		
Pressure range	−0.5...16 barg		
Ambient conditions			
Temperature range	• Sender/receiver units: −40...+158 °F (−40...+70 °C); option: −58...158 °F (−50...+70 °C) • MCU control unit: −40...+140 °F (−40...+60 °C)		
Approval			
Ex-certification S/R unit, zone 1	• ATEX II 2G Ex d [ia] IIC T4 • ATEX II 2G Ex de [ia] IIC T4 • CSA Class I, Div1/Div2; Class I, Zone 1/Zone 2 Option • Temp. class T6 • Zone 0 for ultrasonic transducers ATEX I/2G Ex d [ia] IIC T4	• ATEX II 2G Ex d IIC T4 • ATEX II 2G Ex de IIC T4 • CSA Class I, Div1/Div2; Class I, Zone 1/Zone 2 Option • Temp. class T6	• ATEX II 2G Ex d [ia] IIC T4 • ATEX II 2G Ex de [ia] IIC T4 • CSA Class I, Div1/Div2; Class I, Zone 1/Zone 2 Option • Temp. class T6 • Zone 0 for ultrasonic transducers ATEX I/2G Ex d [ia] IIC T4
S/R unit, zone 2	• ATEX II 3G Ex nA II T4		
Control unit MCU, non-ex Control unit MCU, zone 1 Control unit MCU, zone 2	• for remote installation up to 1,000 m (3,280 ft) away from measuring point • ATEX II 2G Ex d IIC T4; CSA Class I, Div1; Class I, Zone 1 (pending) • ATEX II 3G Ex nA II T4; CSA Class I, Zone 2		
Protection class S/R unit Control unit MCU	• Aluminium, stainless steel IP 65/67 • Steel, stainless steel wall housing IP 65; Ex d housing IP 66; 19" rack housing		
Inputs, outputs, controls via MCU control unit			
Analog output	1 output active: 0/2/4...22 mA, max. load 750 Ω [5], according to NAMUR NE43		
Analog inputs	2 inputs: 0...5/10 V or 0...20 mA [5]		
Digital outputs	Pulse/frequency output (opt. module); 5 outputs: 30 V DC/2A, 120 V AC/1 A, floating, status signals: operation/malfunction, maintenance, check cycle, limit value, maintenance request [5]		
Digital inputs	4 inputs for connection of floating contacts [5]		
Interfaces	• USB • RS232 (service) • RS485 via optional module • Ethernet via optional module		
Bus protocol (option)	• MODBUS via RS485 or via Ethernet • PROFIBUS DP via RS485 • TCP/IP via Ethernet • HARTBUS (pending) • Foundation Fieldbus [6]		
General			
System components	• Sender/receiver unit(s) FLSE100 • MCU control unit, optional 24 V DC version • Mounting parts (nozzles, ball valves, mounting material)		
Operation	Via MCU control unit or SOPAS ET software		
Check function	Internal check cycle for zero-point and span check		

[1] Depending on pipe size
[2] For fully developed flow profile
[3] Flow calibrated
[4] Hydrocarbons
[5] Option: additional inputs/outputs when using I/O modules
[6] On request

SICK Process Automation Division
United States - Minneapolis, Minnesota | Houston, Texas | 281-436-5100
Canada - Calgary, Alberta | Toronto, Ontario | 905-771-1444
information@sick.com | www.sicknorthamerica.com

SICK Sensor Intelligence.

3.6 Dati tecnici*) ULTRAMAT 6E

Campi di misura	4 per canale, commutabili internamente ed esternamente; è possibile anche la commutazione automatica del campo di misura
Ampiezza minima del campo di misura	dipendente dall'applicazione CO: da 0 a 10 vpm CO_2: da 0 a 5 vpm
Ampiezza massima del campo di misura	dipendente dall'applicazione
Caratteristica	linearizzata
Insensibilità CEM (compatibilità elettromagnetica)	secondo gli standard NAMUR NE21 (05/93)
Grado di protezione EN 60529	IP 40
Sicurezza elettr.	secondo EN 61010 - 1, categoria di sovratensione III
Posizione di utilizzo (apparecchiatura)	lato frontale verticale
Dimensioni (apparecchiatura)	vedere fig. 2-17 e 2-18
Peso (apparecchiatura)	ca. 15 kg (con un canale IR) ca. 21 kg (con due canali IR)
Alimentazione	
Alimentazione	da 100 a 120 V AC, (campo di utilizzo nominale da 90 V a 132 V) da 48 a 63 Hz o da 200 a 240 V AC, (campo di utilizzo nominale da 180 a 264 V) da 48 a 63 Hz
Assorbimento di potenza (apparecchiatura)	app. ad un canale ca. 35 VA app. a due canali ca. 70 VA
Valori dei fusibili	100 ... 120V 1T/250 (7MB2121) 1,6T/250 (7MB2123) 200 ... 240V 0,63T/250 (7MB2121) 1T/250 (7MB2123)
Condizioni del gas in ingresso	
Pressione gas campione ammessa	da 0,5 a 1,5 bar ass. con interruttore a pressione integrato: 0,6 a 1,3 bar ass.
Portata del gas campione	da 20 a 90 l/h (da 0,3 a 1,5 l/min)
Temperat. del gas campione	da 0 a 50°C
Umidità del gas campione	< 90% RH [1] oppure dipendente dal compito di misura
Tempi	
Tempo di riscaldamento	a temperatura ambiente: < 30 min
Ritardo della visualizzazione (tempo T_{90})	dipendente dalla lunghezza della camera analisi, dalla conduttura del gas da misurare e dallo smorzamento parametrizzabile
Smorzamento (costante di tempo elettrica)	da 0 a 100 s, parametrizzabile
Tempo morto (tempo di lavaggio dello conduttura gas nell'apparecchio con una portata di 1 l/min)	ca. da 0,5 a 5 sec. a seconda della versione
Tempo per l'elaborazione interna dei segnali	< 1 s
Campo di correzione della pressione	
Sensore di pressione (interno o esterno)	da 0,6 a 1,2 bar ass. (interno) risp. da 0,6 a 1,5 bar ass. (esterno)

Misura [2]	
Variazioni del segnale d'uscita	< ± 1% del campo di misura più minimo secondo targhetta di tipo nella costante di smorzamento specifica all'apparecchio (questa corrisponde ±t 0,33 % in 2 σ)
Deriva del punto zero	< ± 1% del campo di misura / settimana
Deriva del valore di misura	< ± 1% del campo di misura / settimana
Precisione di riproducibilità	≤1% del relativo campo di misura
Differenza della linearità	< 0,5 % del valore finale del c. m.
Influenze [3]	
Temperatura ambiente	< 1% del campo di misura / 10 K
Pressione del gas campione	con correzione della pressione attivata: < 0,15% del setpoint/1% di variazione della pressione barometrica
Portata del gas campione	trascurabile
Alimentazione	< 0,1% del segnale di uscita con tensione nominale ± 10%
Condizioni ecologiche	possibili influenze dipendenti dal campo di misura nel caso l'aria ambientale contenga componente di misura o gas trasversali
Ingressi ed uscite elettriche per ogni canale	
Uscita analogica	da 0 / 2 / 4 a 20 mA, libera da potenziale carico ≤ 750 Ω
Uscite a relè	6 con contatti di scambio, liberamente parametrizzabili, per esempio per il riconoscimento del campo di misura; caricabilità: AC/DC 24 V / 1 A libere da potenziale, senza disturbi
Ingressi analogici	2, predisposti da 0 / 2 / 4 a 20 mA per il sensore di pressione esterno e per la correzione delle influenze del gas di trasporto
Ingressi digitali	6, predisposti a 24 V, liberi da potenziale, liberamente parametrizzabili, per esempio per la commutazione del campo di misura
Interfaccia seriale	RS 485
Opzioni	elettronica supplementare con 8 ingressi digitali ed 8 uscite a relè supplementari, per esempio per l'attivazione della calibrazione automatica elettronica supplementare per Profibus PA (in preparazione)
Condizioni ambientali	
Temperatura ambiente permessa	da -30 bis +70°C per immagazzinamento e trasporto da +5 bis +45°C in funzionamento
Umidità permessa	< 90% RH [1] in media annuale, per immagazzinamento e trasporto [4]

1) RH: umidità relativa
2) La massima precisione viene raggiunta dopo 2 ore
3) Riferite ad una pressione del gas campione di 1 bar assoluto, una portata del gas campione di 0,5 l/min ed una temperatura ambiente di 25 °C
4) Senza superamento del punto di rugiada
*) nel senso a DIN EN 61207-IEC 1207

3.7 Dati tecnici*) OXYMAT 6E

Campi di misura	4, commutabili internamente ed esternamente; è possibile anche la commutazione automatica del campo di misura
Campo di misura minimo[3]	0,5 Vol.%, 2 Vol.% oppure 5 Vol.% O_2
Campo di misura massimo	100 Vol.% O_2 (in una pressione >2 bar: 25 % vol. O_2)
Campi di misura con punto di zero soppresso	tra 0 e 100 Vol.% è realizzabile qualsiasi punto di zero, utilizzando però un gas di riferimento adatto (vedere Tabella 3.1)
Insensibilità CEM (compatibilità elettromagnetica)	secondo gli standard NAMUR NE21 (05/93)
Grado di protezione (EN 60529)	IP 40
Sicurezza elettr.	secondo EN 61010 - 1, categoria di sovratensione III
Posizione di utilizzo (apparecchiatura)	lato frontale verticale
Dimensioni (apparecchiatura)	vedere fig. 2-17 e 2-18
Peso (apparecchiatura)	ca. 13 kg (con solo un canale O_2) ca. 19 kg (con canali O_2 ed IR)
Alimentazione	
Alimentazione	da 100 a 120 V AC, (campo di utilizzo nominale da 90 V a 132 V) da 48 a 63 Hz o da 200 a 240 V AC, (campo di utilizzo nominale da 180 a 264 V) da 48 a 63 Hz
Assorbimento di potenza (apparecchiatura)	app. ad un canale ca. 35 VA app. a due canali (ULTRAMAT/OXYMAT 6) ca. 70 VA
Valori dei fusibili	100 ... 120V 1T/250 (7MB2021) 1,6T/250 (7MB2023) 200 ... 240V 0,63T/250 (7MB2021) 1T/250 (7MB2021)
Condizioni del gas in ingresso	
Pressione del gas campione	da 0,5 a 1,5 bar assoluta in apparecchi a tubi flessibili, con interruttore a pressione integrato: 0,5 a 1,3 bar ass., 0,5 a 3 bar in apparecchi a tubi fissi
Portata del gas campione	da 20 a 60 l/h (da 0,3 a 1 l/min)
Temperat. del gas campione	da 0 a 50°C
Umidità del gas campione	< 90% RH [1] oppure dipendente dal compito di misura
Tempi	
Tempo di riscaldamento	a temperatura ambiente: < 30 min [2]
Ritardo della visualizzazione (tempo T_{90})	dipendente dalla lunghezza della camera analisi, dalla conduttura del gas da misurare e dallo smorzamento parametrizzabile
Smorzamento (costante di tempo elettrica)	da 0 a 100 s, parametrizzabile
Tempo morto (tempo di lavaggio della conduttura gas ci nell'apparecchiatura con una portata di 1 l/min)	ca. da 0,5 a 2,5 sec. a seconda della versione
Tempo per l'elaborazione interna dei segnali	< 1 s
Campo di correzione della pressione	
Sensore di pressione (interno o esterno)	da 0,5 a 2 bar ass. (interno) risp. da 0,5 a 3 bar ass. (esterno)
Misura [3]	
Deriva del punto zero	< 0,5 % del campo di misura per mese dalla più piccola possibile spanna di misura secondo targhetta di tipo

Rumori (costante di tempo elettrica 1 s,campo 2 σ)	< 0,75% del campo di misura più minimo secondo targhetta di tipo nella costante di smorzamento specifica all'apparecchio (questa corrisponde ±t 0,25 % in 2 σ)
Deriva del valore di misura	< 0,5% per mese della relativa spanna di misura
Riproducibilità	≤ 1% della relativa spanna di misura
Differenza della linearità	< 1% della relativa spanna di misura
Influenze [3]	
Temperatura ambiente	< 0,5% / 10 K riferita alla più piccola spanna di misura secondo targhetta di tipo
Pressione del gas campione	con compensazione della pressione disattivata: < 2% della spanna di misura per ogni 1% di variazione della pressione; con compensazione della pressione attivata: < 0,2% della spanna di misura per ogni 1% di variazione della pressione
Gas apparenti	deviazione del punto zero dipendente dalla deviazione paramagnetica e diamagnetica del gas apparenti (vedere Tabella 3.2)
Portata del gas campione	< 1% del campo di misura minimo secondo i dati di targa con una variazione della portata di 0,1 l/min all'interno del campo dei valori di portata permessi
Alimentazione	< 0,1% del segnale di uscita con tensione nominale ±10%
Ingressi ed uscite elettriche	
Uscita analogica	da 0 / 2 / 4 a 20 mA, libera da potenziale, carico 750 Ω
Uscite a relè	6, con contatti di scambio, liberamente parametrizzabili, per esempio il riconoscimento del campo di misura caricabilità: AC/DC 24 V / 1 A, libere da potenziale
Ingressi analogici	2, predisposti da 0 / 2 / 4 a 20 mA per il sensore di pressione esterno e per la correzione delle influenze del gas apparenti (gas trasversali)
Ingressi digitali	6, predisposti a 24 V, liberi da potenziale, liberamente parametrizzabili, per esempio per la commutazione del campo di misura
Interfaccia seriale	RS 485
Opzioni	elettronica supplementare con 8 ingressi digitali ed 8 uscite a relè supplementari, per esempio per l'attivazione della calibrazione automatica; elettronica supplementare per Profibus PA (in preparazione)
Condizioni ambientali	
Temperatura ambiente permessa	da -30 bis +70°C per immagazzinamento e trasporto da +5 bis +45°C in funzionamento
Umidità permessa	< 90% RH [1] in media annuale, per immagazzinamento e trasporto [4]

1) RH: umidità relativa
2) La massima precisione viene raggiunta dopo 2 ore
3) Riferite ad una pressione del gas campione di 1 bar assoluto, una portata del gas campione di 0,5 l/min ed una temperatura ambiente di 25°C
4) Senza superamento del punto di rugiada
*) in senso a DIN EN 61207/IEC 1207

TÜV SÜD
Industrie Service

Certificate

TÜV Süd Industrie Service GmbH

Laboratory for Environmental Services
(Laboratorium Umwelt Service)
accredited according DIN EN ISO/IEC 17025 DAP-PL-2885.99

LDS 6 7MB6121/ CD 7MB6122
Gas Analyser for HCl/ H_2O
Report Nr. 840754 (December 2006)

Manufacturer:
Siemens Laser Analytics AB, Sweden

TÜV Süd Industrie Service GmbH is herewith certifying that the analyser LDS 6 7MB6121 combined with the sensor CD 6 7MB6122 is in accordance with DIN EN ISO 14956, Jan. 2003 (QAL1 of EN 14181). The following expanded uncertainty was determined:

Component	**C_{test} (daily emission limit value) mg/ m^3**	**Range of measurement mg/ m^3**	**Expanded uncertainty mg/ m^3**	**Demanded uncertainty mg/ m^3**
HCl	10	0-90	3,2	4,0

The response time was <3 s (demanded value: 200 s).
For water there exists no demand; the analyser can be used in combination with other tested measuring systems which fulfil QAL 1 of EN 14181.

The calculation according DIN EN ISO 14956 was performed on the basis of the results of the investigations for report Nr. 840754 (December 2006) and under consideration of DIN EN 15267-3 draft, August 2005. The following performance characteristics were regarded: response time; lower detection limit; lack of fit; instability/ drift; reproducability; sensitivity to ambient temperature, ambient pressure, voltage supply and gas flow; selectivity/ interfering components; uncertainty of calibration gas; deviation of working beam; accumulation of dirt

Munich, February 2007

Dr. M. Waeber

M. Lechner

Laboratorium Umwelt Service, TÜV Süd Industrie Service GmbH, IS-US3-MUC, Westendstrasse 199, D-80686 München

TÜV SÜD

Industrie Service

Bescheinigung

TÜV Süd Industrie Service GmbH

Laboratorium Umwelt Service

Akkreditiert gemäß DIN EN ISO/IEC 17025 DAP-PL-2885.99

LDS 6 7MB6121/ CD 6 7MB6122

Messeinrichtung für HCl/ H_2O

Bericht Nr. 840754 (Dezember 2006)

<u>Hersteller:</u>

Siemens Laser Analytics AB, Schweden

Die TÜV Süd Industrie Service GmbH bestätigt hiermit, dass die Messeinrichtung mit dem Analysator LDS 6 7MB6121 und Sensor CD 6 7MB6122 folgende Gesamtunsicherheit gemäß DIN EN ISO 14956, Jan. 2003 (QAL 1 nach EN 14181) aufweist:

Komponente	**C_{test} (Tagesmittel-wert) mg/ m³**	**Geprüfter Messbereich mg/ m³**	**Erweiterte Messunsicher-heit mg/ m³**	**Geforderte Messunsicher-heit mg/ m³**
gasförmige anorganische Chlorverbindungen, als HCl	10	0-90	3,2	4,0

Die Einstellzeit lag mit < 3 s unter 200s.
Bezüglich H_2O gibt es keine Anforderungen; die Messeinrichtung kann in Verbindung mit anderen eignungsgeprüften Messeinrichtungen, welche QAL 1 der DIN EN 14181 erfüllen eingesetzt werden.

Die Berechnung gemäß DIN EN ISO 14956 wurde auf Grundlage der Ergebnisse der Untersuchungen für den Bericht Nr. 840754 (Dezember 2006) unter Berücksichtigung des Berechnungsbeispieles der DIN EN 15267-3, Entwurf August 2005 durchgeführt.
Die folgenden Verfahrenskenngrößen wurden berücksichtigt: Einstellzeit; Nachweisgrenze; Linearität; Driftverhalten; Vergleichspräzision; Umgebungstemperatureinfluss; Einfluss von Luftdruck, Netzspannung und Durchfluss; Querempfindlichkeiten; Prüfgasunsicherheit; Auswandern Messstrahl; Verschmutzung Optik

München, Februar 2007

Dr. M. Waeber

M. Lechner

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TÜV SÜD
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Bescheinigung

TÜV Süd Industrie Service GmbH

Laboratorium Umwelt Service

Akkreditiert gemäß DIN EN ISO/IEC 17025 DAP-PL-2885.99

Oxymat 6 E,F 7MB20

Gas Analysator für O_2

Bericht Nr. 24019084 (Februar 1999)

Hersteller:

Siemens AG, Karlsruhe, Deutschland

Die TÜV Süd Industrie Service GmbH bestätigt hiermit, dass die Messeinrichtung mit dem Analysator Oxymat 6 E, F 7MB20 für die Komponente O_2 unter Zugrundelegung der DIN EN ISO 14956, Jan. 2003 und DIN EN 15267-3 Entwurf, August 2005 folgende Messunsicherheit aufweist:

Komponente	**C_{test} Vol.-%**	**Messbereich Vol.-%**	**erweiterte Messunsicherheit U nach DIN EN ISO 14956**
Sauerstoff, O_2	11	0-25	0,49 Vol.-% entsprechend 2 % v. MBE

Die Messeinrichtung kann in Verbindung mit anderen eignungsgeprüften Messeinrichtungen welche QAL 1 der DIN EN 14181 erfüllen eingesetzt werden.

Die Berechnung gemäß DIN EN ISO 14956 wurde auf Grundlage der Ergebnisse der Untersuchungen für den Bericht Nr. 24019084 (Februar 1999) zur Überprüfung der Einhaltung der deutschen Mindestanforderungen durchgeführt. Die folgenden Verfahrenskenngrößen wurden berücksichtigt: Einstellzeit, Nachweisgrenze, Linearität, Driftverhalten, Vergleichspräzision, Umgebungstemperatureinfluss, Einfluss von Luftdruck, Netzspannung und Durchfluss, Messgasverluste, Querempfindlichkeiten, Prüfgasunsicherheit

München, Januar 2006

Dr. D. Fiederer　　　　Dr. A. Brandl

Laboratorium Umwelt Service, TÜV Süd Industrie Service GmbH, IS-US3-MUC,
Westendstrasse 199, D-80686 München

Industrie Service

Certificate

TÜV Süd Industrie Service GmbH

Laboratory for Environmental Services
(Laboratorium Umwelt Service)
accredited according DIN EN ISO/IEC 17025 DAP-PL-2885.99

Oxymat 6E,F 7MB20
Gas Analyser for O_2
Report Nr. 24019084 (February 1999)

Manufacturer:
Siemens AG, Karlsruhe, Germany

TÜV Süd Industrie Service GmbH is herewith certifying that the analyser Oxymat 6E,F 7MB20 for O_2 has the following expanded uncertainty (calculated according DIN EN ISO 14956, Jan. 2003 and prEN 15267-3, August 2005):

Component	**C_{test} Vol.-%**	**Range of measurement Vol.-%**	**Expanded Uncertainty according EN ISO 14956**
Oxygen, O_2	11	0-25	0,49 Vol.-% (2 % of range of measurement)

The analyser can be used in combination with other tested measuring systems which fulfil QAL 1 of EN 14181.

The calculation according DIN EN ISO 14956 was performed on the basis of the results of the investigations of report 24019084 (February 1999) for the German suitability test.
The following performance characteristics were regarded: Response time; lower detection limit; lack of fit; instability/ drift; repeatability; sensitivity to ambient temperature, ambient pressure, voltage supply and gas flow; sample losses, selectivity/ interfering components; uncertainty of calibration gas

Munich, January 2006

Dr. D. Fiederer

Dr. A. Brandl

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Westendstrasse 199, D-80686 München

Deutscher Akkreditierungs Rat

DAR

DAP-PL-3856.99

TÜVRheinland®

Precisely Right.

CERTIFICATE

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH

Manufacturer:	SICK Maihak GmbH
Measuring System:	FLOWSIC100
Components:	Gas velocity
Test Report:	936/21206702/B, 2008-02-28

The measurement system fulfils
the requirements of
QAL 1
according to EN 14181 and EN ISO 14956.

Köln, 2008-06-20 — Dr. rer. nat. Peter Wilbring — Dipl.-Chem. Martin Kerpa

www.umwelt-tuv.de / www.eco-tuv.com tie@umwelt-tuv.de Tel. +49 - 221 - 806 - 2275	TÜV Rheinland Immissionsschutz und Energiesysteme GmbH Am Grauen Stein 51105 Köln The company is accredited to DIN EN ISO/IEC 17025.

attached: 2 page(s)

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EN ISO 14956 and EN 15267-3 calculation for QAL1 in EN 14181

Manufacturer data	
Manufacturer	Sick Maihak GmbH
Measurement System	Gas velocity measurement system 1
Name	Flowsic100
Serial Number	SN 07118724
Measuring Principle	Ultrasound
TÜV Data	
Approval Report	936/21206702/B
Date	07.11.2007
Editor	Kerpa
Measurement Component	Gas velocity 20 m/s

Calculation of the combined standard uncertainty

Test Value		$\Delta X_{max,j}$	$u(\Delta X_{max,j}) = \frac{\Delta X}{\sqrt{3}}$	$u(\Delta X_{max,j})^2$
Lack of fit	u_L	-0,54 m/s	-0,31 m/s	0,097
Biggest interference (positiv or negativ)	u_I	0,00 m/s	0,00 m/s	0,000
Span shift in the field test	$u_{d,s}$	0,08 m/s	0,05 m/s	0,002
Zero shift in the field test	$u_{d,z}$	0,08 m/s	0,05 m/s	0,002
Sensitivity to ambient temperature	u_t	0,04 m/s	0,02 m/s	0,000
Dependence on supply voltage	u_{sv}	-0,05 m/s	-0,03 m/s	0,001
Repeatability at span	u_s	0,08 m/s	0,05 m/s	0,002
Field reproducibility	u_D	0,06 m/s	0,04 m/s	0,001
Combined standard uncertainty (u_C)	u_c	$u_c = \sqrt{\Sigma(u_{max,j})^2}$		0,326
Total expanded uncertainty	(u_c * k)	$U_c = u_c * 1,96$		0,640
Relative total expanded uncertainty		Uc in % of the limit 20 m/s		3,2
Requirement		Uc in % of the limit 20 m/s		7,5

Result: Requirements keep to QAL 1 of EN 14181

Attention: For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.

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EN ISO 14956 and EN 15267-3 calculation for QAL 1 in EN 14181

Manufacturer data

Manufacturer	Sick Maihak GmbH
Measurement System	Gas velocity measurement system 2
Name	Flowsic100
Serial Number	SN 07118726
Measuring Principle	Ultrasound

TÜV Data

Approval Report	936/21206702/B
Date	07.11.2007
Editor	Kerpa

Measurement Component gas velocity 20 m/s

Calculation of the combined standard uncertainty

Test Value		$\Delta X_{max,j}$	$u(\Delta X_{max,j}) = \frac{\Delta X}{\sqrt{3}}$	$u(\Delta X_{max,j})^2$
Lack of fit	u_L	-0,66 m/s	-0,38 m/s	0,145
Biggest interference (positiv or negativ)	u_I	0,00 m/s	0,00 m/s	0,000
Span shift in the field test	$u_{d,s}$	0,04 m/s	0,02 m/s	0,001
Zero shift in the field test	$u_{d,z}$	0,02 m/s	0,01 m/s	0,000
Sensitivity to ambient temperature	u_t	0,02 m/s	0,01 m/s	0,000
Dependence on supply voltage	u_{sv}	-0,02 m/s	-0,01 m/s	0,000
Repeatability at span	u_s	0,02 m/s	0,01 m/s	0,000
Field reproducibility	u_D	0,06 m/s	0,04 m/s	0,001

Combined standard uncertainty (u_C)	u_c	$u_c = \sqrt{\Sigma(u_{max,j})^2}$	0,384
Total expanded uncertainty	(u_c * k	$U_c = u_c * 1,96$	0,753
Relative total expanded uncertainty		Uc in % of the limit 20 m/s	3,8
Requirement		Uc in % of the limit 20 m/s	7,5

Result: Requirements keep to QAL 1 of EN 14181

Attention: For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.

Deutscher Akkreditierungs Rat

DAR

DAP-PL-3856.99

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CERTIFICATE

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH

Manufacturer:	**SICK Engineering GmbH, Ottendorf-Okrilla**
Measuring System:	**DUSTHUNTER SB100**
Components:	**Dust**
Test Report:	**936/21208609/A** **2008-10-24**

The measurement system fulfils
the requirements of
QAL 1
according to EN 15267-3 and EN 14181.

Köln, 2009-02-16

Dr. rer. nat. Peter Wilbring

Dipl.-Chem. Martin Kerpa

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attached: 1 page(s)

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EN ISO 14956 and EN 15267-3 calculation for QAL1 in EN 14181

Manufacturer data	
Manufacturer	Sick Engineering GmbH
Name of measuring system	DUSTHUNTER SB100
Serial Number	07498579 / 07498578
Measuring Principle	back scattered ligt
TÜV Data	
Approval Report	936/21208609/x
Date	20.10.2008
Editor	Baum
Measurement Component	dust
certificated range	15 mg/m³

Calculation of the combined standard uncertainty

Test Value		$\Delta X_{max,j}$	u^2
Repeatability standard deviation at span *	u_{lof}	0,11 mg/m³	0,012
Lack of fit	$u_{d.z}$	0,09 mg/m³	0,003
Zero drift from field test	$u_{d.s}$	-0,29 mg/m³	0,027
Span drift from field test	u_t	-0,28 mg/m³	0,027
Influence of ambient temperature at span	u_p	0,00 mg/m³	0,000
Influence of supply voltage	u_f	0,11 mg/m³	0,004
Influence of sample pressure	u_i	0,00 mg/m³	0,000
Uncertainty of reference material	u_{rm}	0,30 mg/m³	0,030

* The greater value of: "Repeatability standard deviation at span" or "Standard deviation from paired measurements under field condition:

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0,319
Total expanded uncertainty	$U = u_c * k = u_c * 1{,}96$	0,626
Relative total expanded uncertainty	U in % of the ELV 10 mg/m³	6,3
Requirement	U in % of the ELV 10 mg/m³	22,5

Result: Requirements of EN 15267-3 are fulfilled -> QAL1 pass