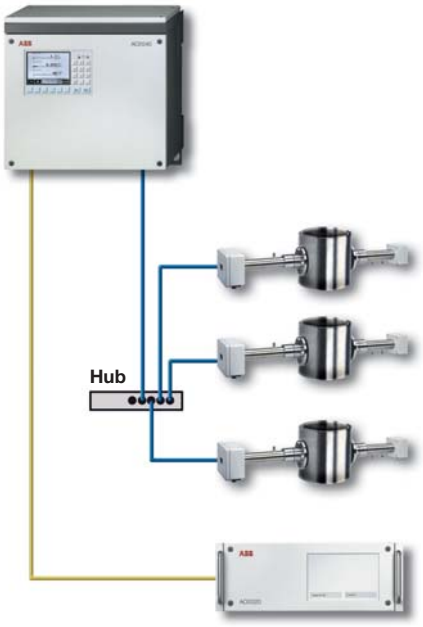
LS25

The LS25 laser analyzer selectively measures the concentration of up to two sample components. The laser operates according to the principle of single-line spectroscopy. For measurement purposes a single absorption line is selected from the gas to be measured in the near infrared spectral range, at which no cross-sensitivity from other gases occurs. The absorption line is scanned and the receiver located opposite detects the absorption caused by the sample gas and calculates the gas concentration from this.

The laser analyzer module consists of a transmission and receiver unit which can be used on ducts with a diameter of 0.5...6 m. Depending on the application, process pressures of 10 bar and temperatures up to 1500 °C can be achieved.

Multianalyzer systems allow the combination of up to four analyzer modules from the product range.



Typical applications

- Emission monitoring
- Combustion control
- Process monitoring and analysis in the chemical industry, steel and iron manufacture, power industry and glass manufacture.
- Control of DeNOx installations

Sample components – smallest measuring ranges (examples)

- O_2 0...1 Vol.-%, 10 bar, 1,500 °C
- CO 0...3,000 mg/m³, 3 bar, 1,500 °C
- CO_2 0...3,000 mg/m³
- HCl 0...7 mg/m³
- H_2S 0...300 mg/m³
- NH_3 0...10 mg/m³
- H_2O 0...3 mg/m³ low levels
- H_2O 0...1 Vol.-% high levels

Calibration

- Calibration takes place either via a built-in flow cell or a separate calibrating cell.

Measurement Principle

The LS25 laser analyzer module is based on a measuring principle called single-line spectroscopy. One single target gas absorption line with no interference is chosen in the near infrared spectral range. A single mode diode laser operating around room temperature scans this single absorption line. A detector diametrically opposite detects the light and the absorption caused only by the target gas molecules. Once the absorption by the target gas molecules is detected, the gas concentration is calculated. Automatic corrections for temperature and pressure variations are included.

Sample Components and Measurement Ranges

The LS25 laser analyzer module has one physical measurement range per sample component. The indicated measurement range can be freely adjusted within the physical measurement range. The smallest detection limits and corresponding measurement ranges are shown in the table below:

Sample Component	Min. Measurement Range	Max. Pressure	Max. Temperature
O_2	0– 1 Vol.-%	10 bar	1500 °C
CO	0– 25 mg/m³	2 bar	1200 °C
	0–3000 mg/m³	3 bar	1500 °C
CO_2	0– 40 mg/m³	2 bar	300 °C
	0–3000 mg/m³	3 bar	300 °C
	0– 1 Vol.-%	2 bar	1500 °C
HCl	0– 7 mg/m³	2 bar	300 °C
H_2S	0– 300 mg/m³	1.5 bar	300 °C
HF	0– 1 mg/m³	2 bar	300 °C
HCN	0– 20 mg/m³	2 bar	300 °C
NH_3	0– 10 mg/m³	1.5 bar	400 °C
CH_4	0– 20 mg/m³	2 bar	300 °C
H_2O	0– 3 mg/m³	2 bar	400 °C
	0– 1 Vol.-%	1.5 bar	1500 °C
N_2O	0– 700 mg/m³	1.5 bar	300 °C
NH_3 + H_2O	0– 10 mg/m³ 0– 1 Vol.-%	1.5 bar	400 °C
HCl + H_2O	0– 10 mg/m³ 0– 1 Vol.-%	1.5 bar	150–400 °C
HCl + H_2O	0– 35 mg/m³ 0– 5 Vol.-%	2 bar	150 °C
HF + H_2O	0– 1 mg/m³ 0– 1 Vol.-%	1.5 bar	300 °C
CO + CO_2	0– 2 Vol.-% 0– 1 Vol.-%	1.5 bar	400 °C
O_2 + Temp.	0– 1 Vol.-%	1.5 bar	1500 °C

All specifications refer to an optical path length (OPL) of 1 meter, tested in ABB's test/calibration jig. The standard optical path length ranges from 0,5 to 6 m. Application-dependent variations may occur. To obtain minimum measurement ranges in some cases additional measures have to be taken: 0–1 Vol.-% O_2 require purging with N_2. Actual detection limit for a specific application will depend on the gas conditions (pressure, temperature and gas composition) and optical path length. If more than one min. measurement range is shown there are different instrument versions available. Other sample components on request.

Min. measurement range, max. pressure and max. temperature cannot necessarily be realized simultaneously. The maximum pressure and temperature given are physical (spectroscopic) limits. Applications with increased temperature or pressure or with toxic or flammable gas may require additional equipment.

Stability

Zero Drift
< 2 % of smallest possible measurement range per 3 months

Span Drift
< 4 % of measurement range per 3 months

Output Fluctuation (2 σ)
≤ 0.5 % of smallest measurement range

Detection Limit (4 σ)
≤ 1 % of smallest measurement range

Measurement Ranges

Quantity
1 range per sample component, 1 x transmission

Largest Measurement Range
Largest measurement range is generally 100 times the minimum measurement range for the same conditions. Larger measurement ranges are normally possible by adaptation of measuring path and choice of a weaker absorption line.

Limit Value Monitoring (Alarm)
Limit values can be set during system configuration. The limit value signal (alarm) is output via the digital ports.

Calibration

Maintenance Interval
Recommended every 3 months (no consumables needed)

Zero-Point Check
With inert gas, e.g. N_2, or with ambient air free of the sample component. Due to the measurement principle, there is no zero-point drift.

Calibration
With test gas and a flow-through test cell

Influence Effects

Flow Effect
No effect on the measurement, but the flow will determine the amount of purge gas needed.

Associated Gas Effect/Cross Sensitivity
No cross sensitivity within normal operation conditions.

Temperature Effect
- Ambient temperature in permissible range:
  No significant effect
- Gas temperature effect on sensitivity with temperature compensation:
  Typically ≤ 2 % of measured value per 10 °C (dependent on type of gas and gas conditions). For large variations in gas temperature (> ±20 °C) separate temperature measurement for compensation is recommended.

Air Pressure Effect
At zero-point: No effect
Automatic compensation by measurement of absorption line width, alternatively by input from pressure sensor.

Power Supply Effect
24 VDC ± 5 %: ≤ 0.2 % of span

Dynamic Response

Warm-Up Time
Approx. 1 hour

Response Time
Less than 2 seconds without signal averaging

Materials in Contact with the Process Gas

Purging Unit
316 SS

Window
BK7 glass, optional: Fused Silica

Mounting

Standard Mounting
DN50/PN10 flange

Alignment Tolerances
Flanges parallel within 1.5°

Purging of Windows
Dry and oil-free pressurized air or gas, or by fan

Gas Ports for Purging
Standard: 3/8-inch hose nozzle for hoses with 10 mm inner diameter. See page 31 for connection drawing.

Weight

Transmitter unit plus flange with purging unit:	9.5 kg
Receiver unit plus flange with purging unit:	7.2 kg
Flow-through test cell:	3.8 kg

Electrical Connections on Transmitter Unit

Connection to Central Unit
Ethernet 10/100BASE-T, RJ45 connector;
Cable length: Standard 15 m, max. 100 m

Connection to Receiver Unit
15-pin female Sub-D connector;
Cable length: Standard 5 m, max. 150 m

Power Supply, External Pressure and Temperature Signals
15-pin male Sub-D connector;
Cable length Laser unit–Power supply: Standard 3 m, max. 100 m; Cable length Power supply–Plug: 3 m

Service Computer
RS232, 9-pin female Sub-D connector

See page 30 for connection drawing.

Gas Inlet Conditions

Process Gas
Maximum process gas temperature and pressure are given in the "Sample Components and Measurement Ranges" table. Quantification of dust/particle concentration is necessary in order to determine max OPL.

Purge Gas
The purge gas should not contain any sample gas components and must be oil- and dust-free.

Power Supply

Input Voltage
24 VDC ± 5 % from an external power supply unit 115/230 VAC (part of delivery)

Power Consumption
Approx. 20 W

Installation Site Requirements

Vibration
Max. ±0.6 mm around the optical axis, frequency < 500 Hz

Ambient Temperature
Operation: –20 to +55 °C, no direct sunlight on transmitter and receiver units;
Storage and transport: –25 to +65 °C

Mounting Location
The mounting location strongly influences the measurement result. The measurement gas must be well stirred at the selected location to produce a representative measurement result. Stratification in the measurement gas path results in erroneous measurement. If the measurement gas is charged with dust, the LS25 must be mounted at right angles to the process gas flow.

Explosion-Proof Version

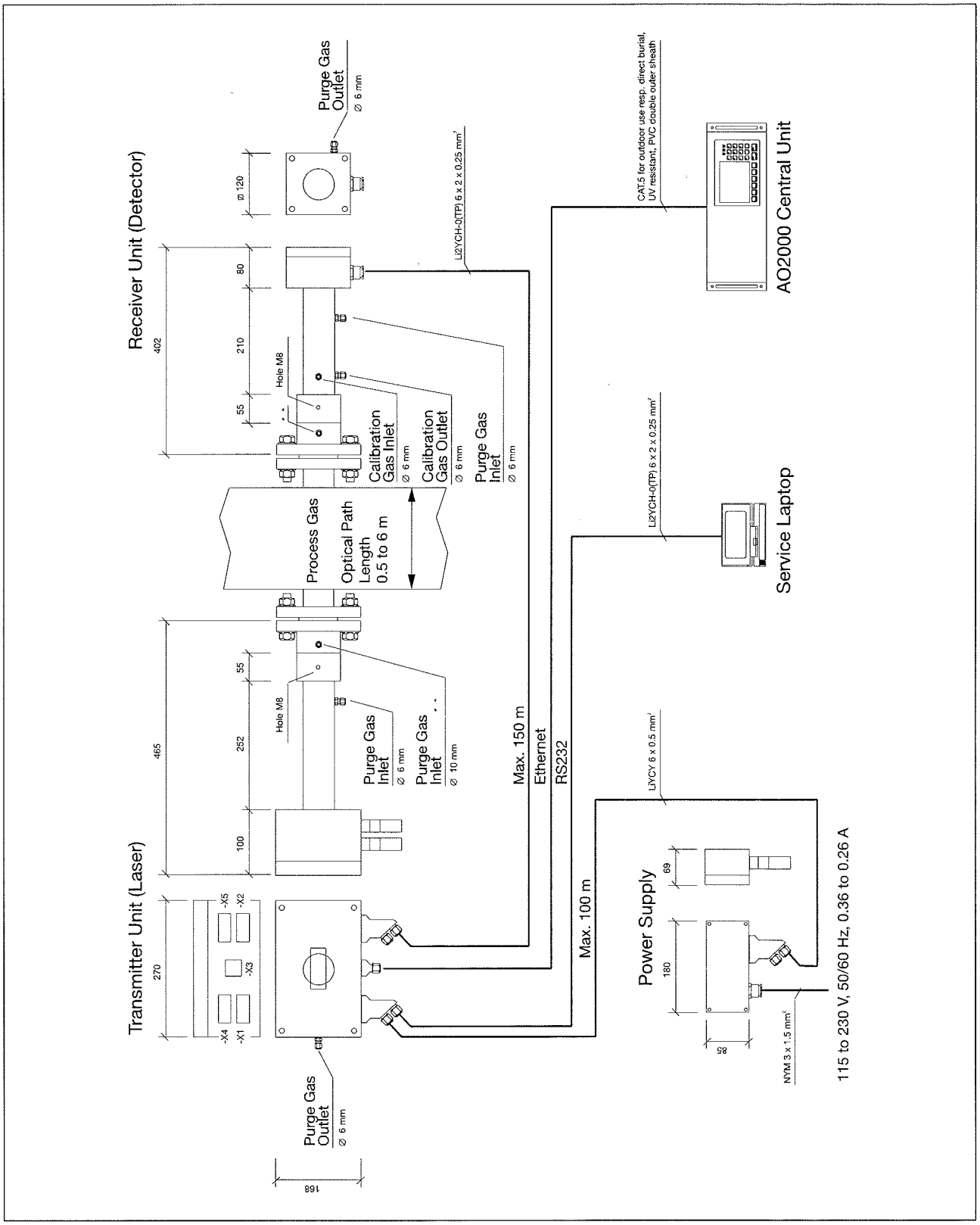
The AO2000-LS25 Ex analyzer module in the Equipment group II, Category 2GD version is suited for use in areas in which explosive atmospheres caused by vapors, gases, mists, or air/dust mixtures are likely to occur.

Designation
Ⓔx II 2 G Ex px II T5
Ⓔx II 2 D Ex pD 21 IP66 T64 °C

EC-Type Examination Certificate
DNV-2006-OSL-ATEX-0042X Rev. 2

Housing Protection Type
IP66

Dimensions and Electrical Connections (Ex-free application)



Gas Connections (Ex-free application)