

Model

LGA-4000

Process LaserGas Analysis System

Tunable Diode Laser Absorption Spectroscopy (TDLAS)



MODEL LGA-4000 Process Laser Gas Analysis System

PROCESS LASER GAS ANALYSIS SYSTEM

Using Tunable Diode Laser Absorption Spectroscopy (TDLAS) technology, Teledyne offers the LGA-4000 process laser gas analysis system, applicable to almost all environments -- even adverse ones with high temperature, pressure, dust density and corrosion.

The systems use in-situ detection in lieu of sampling and feature high accuracy, quick response, strong reliability, and low costs. The LGA-4000 is ideal for process optimization, energy recovery, safety control, and scientific research as well as environment protection. To date, these units have been employed in metallurgy, petrochemical and chemical industries, environment protection, power plants, and other situations where gas measurement is needed.

TRANSMITTER UNIT



RECEIVER UNIT

TRANSMITTER UNIT

- Generates and launches a collimated modulated laser beam into the gas environment under analysis to the Receiver Unit

RECEIVER UNIT

- Collects the laser beam from the Transmitter Unit, converts the light intensity into an electric signal and sends it real-time to the Central Processing Unit

Gas	Lower Detections Limit	Measurement Range
O2	0.01 %Vol.	0-1 %Vol., 0-100 %Vol.
CO	0.6 ppm	0-60 ppm, 0-100% Vol.
CO2	1.5 ppm	0-150 ppm, 0-100% Vol.
H2O	0.3 ppm	0-30 ppm, 0-100% Vol.
H2S	2 ppm	0-200 ppm, 0-30% Vol.
HF	0.02 ppm	0-2 ppm, 0-10,000 ppm Vol.

Gas	Lower Detections Limit	Measurement Range
HCL	0.01 ppm	0-7 ppm, 0-8,000 ppm Vol.
HCN	0.3 ppm	0-30 ppm, 0-10,000 ppm Vol.
NH3	0.4 ppm	0-40 ppm, 0-100% Vol.
CH4	10 ppm	0-200 ppm, 0-10 %Vol.
C2H2	0.1 ppm	0-10 ppm, 0-100% Vol.
C2H4	0.6 ppm	0-60 ppm, 0-100% Vol.

Notes: I. Listed are gases that can be measured. Others can be made to order. II. Detailed measurement ranges are available on request.



LGA-4000 Two-Sided Sequenced System for Trace Moisture in Chlorine Analysis with PLC and Touch-Screen HMI

CONFIGURATION

The transmitter portion of the LGA-4000 consists mainly of diode laser, laser driver and HMI modules, realizing diode laser driving, spectrum data processing and human-machine interface. The receiver unit of the analyzer, composed of a photoelectric sensor, signal processing and purge control modules, is capable of signal processing and power control.

PRINCIPLE

The laser beam from the transmitter unit passes across the stack or duct work and is absorbed by the measured gas. The attenuated light is then detected by the photoelectric sensor in the receiver unit, and the resulting signal is sent back to the transmitter unit and analyzed to yield gas concentration.

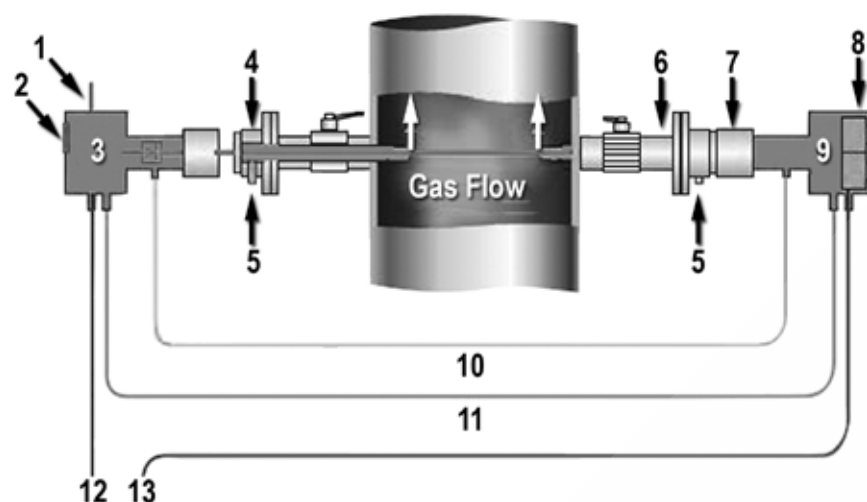
FEATURES

- In-situ or extractive measurement (application dependent), measurement, unique optical design and high sensitivity
- Integrated explosion proof design, compact structure and high reliability
- Modular design, easy replacement of all function modules
- Digital and smart, easy operation and maintenance



MODEL LGA-4000 Process Laser Gas Analysis System

INSTALLATION



1. Bluetooth communication module
2. HMI
3. Transmitter unit
4. Instrument flange
5. Purging gas
6. Welding flange
7. Mounting nut
8. Purge control module
9. Receiver unit
10. Positive pressure gas
11. Measurement site
12. 4-20 mA Input, 4-20mA Output, Relay Output, RS485
13. 24V power supply

SPECIFICATIONS

Linearity:	2% of FS, application dependent
Optical path:	<15m
Maintenance:	<2 times/year, application dependent
Enclosure protection:	IP65
Span drift:	Application dependent
Response time:	<1s
Calibration:	<2 times/year

INTERFACE

Analog output:	2-channel 4-20mA (isolated, 750 Ω max)
Digital interface:	RS485 / GPRS / Bluetooth
Analog input:	2-channel 4-20mA (T, P compensation)
Relay output:	3-channel (24V, 1A)

UTILITIES

Power supply:	24VDC (220VAC optional), <20W
Ambient temperature:	-30 to 60°C
Purging gas:	0.3 - 0.8MPa, 99.99% N ₂ /instrument air

TECHNOLOGY COMPARISON

Item	LGA-4000 Laser Analysis System	Conventional Online Analysis System
Adaptability	Applicable to high temperature & pressure, flowrate and corrosion	Applicable to constant temperature & pressure, moisture and dust-free
Measurement	In-situ, continuous, real-time measurement; sample gas evacuation free	With sample conditioning system, discontinuous measurement
Response time	Fast, only limited by instrument electronics response, less than 1 sec.	Slow, limited by gas sampling, transport, and instrument electronics response, 20+ sec.
Accuracy	Average concentration along the optical path; no cross interference from other gas species, dust, and gas parameter fluctuations	Gas concentration at the tip of the sampling probe only, affected by gas influence, absorption, and leak during gas sampling and transport; cross interference from other gas species, dust, and gas parameter fluctuations; gas information lost due to dissolution, absorption, and leakage
Reliability	No moving parts, highly reliable	Many moving parts, low reliability
Calibration & Maintenance	Calibration: <2 times/year Maintenance: <2 times/year	Calibration: 2-3 times/month Maintenance: frequent
Operation costs	No spare parts, only electricity	Lots of spare parts, ~20% of the equipment cost per year

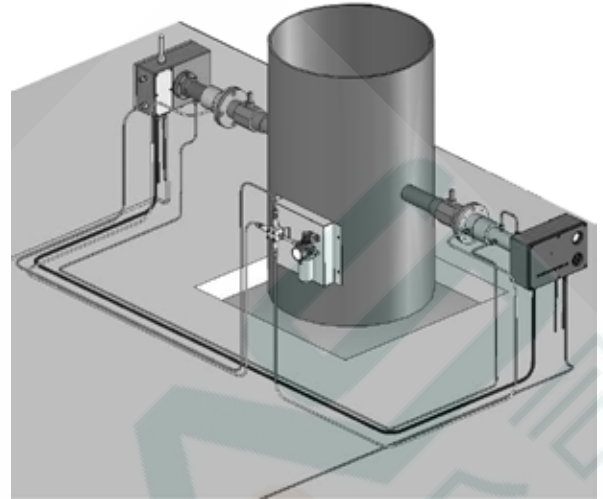
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TECHNICAL PRINCIPLE

TDLAS gas analyzers use a laser spectral scanning technique. The unit periodically scans the gas under test with a modulation frequency range larger than the gas absorption spectral line-width such that, within one scan period, there are two distinctive areas.

Area I is unaffected by the gas absorption and gives T_d , whereas Area II is effected and gives T_{gd} . The transmittance of the gas under test is then calculated accurately by $T_g = T_{gd} / T_d$. The interference from dust and optical window contamination is, therefore, automatically screened out. Automatic compensation for the spectral line broadening eliminates the influence of gas environment parameters (temperature and pressure) variance.

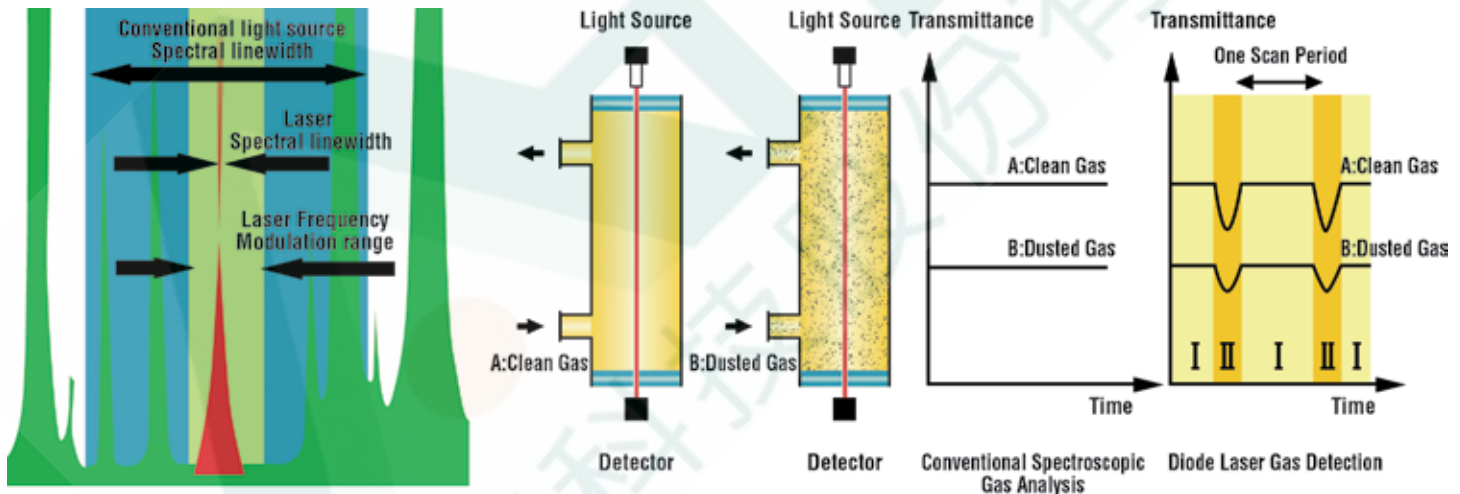
When gas temperature and pressure under measurement undergo changes, the width and height of the measured gas absorption spectral line change, which effects the accuracy of the measurement. By having a 4-20mA process temperature and pressure input, the LGA-4000 analyzer automatically compensates for them with a proprietary algorithm to ensure measurement accuracy.



MODULATED SPECTRUM

Modulation feature of diode laser

Wavelength Modulation → automatically corrects for dust
Phase Signal Detecting (PSD) → high sensitivity.



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