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Focused Photonics Inc.


FPISB-LGA1401100 V2.0HZ

Focused Photonics Inc.

# LGA series

## PROCESS LASER GAS ANALYSIS SYSTEM

Focused Photonics Inc.

# LGA series PROCESS LASER GAS ANALYSIS SYSTEM

Utilizing proprietary technologies of Tunable Diode Laser Absorption Spectroscopy (TDLAS), FPI delivers the LGA system to satisfy in-situ measurements with high accuracy, fast response, strong reliability and virtually maintenance free.

The LGA system is applicable to almost all industrial process, especially well proven in harsh conditions in combination of high temperature, pressure, dust, corrosives and contaminants.

Leveraging an installed base of over 8,000 units, the LGA system has been extensively used for combustion and safety control, process optimization, energy recovery, scientific research as well as environment monitoring. To date, these units have been employed in metallurgy, refinery, petrochemical, natural gas, power plant, waste incineration, cement and other situations where gas measurement is needed.

| Gas | Detection Limit | Measurement Range |
|---|---|---|
| $O_2$ | 0.01%Vol | 0-1%Vol , 0-100%Vol. |
| CO | 0.6 ppm | (0-60)ppm, (0-100)%Vol. |
| $CO_2$ | 1.5 ppm | (0-150)ppm,(0-100)%Vol. |
| $H_2O$ | 0.3 ppm | (0-30)ppm, (0-100)%Vol. |
| $H_2S$ | 2 ppm | (0-200) ppm, (0-30)%Vol. |
| HF | 0.02 ppm | (0-2)ppm, (0-10,000) ppmVol. |
| HCl | 0.01 ppm | (0-7) ppm,(0-8000)ppmVol. |
| HCN | 0.3 ppm | (0-30)ppm, (0-10,000)ppmVol. |
| $NH_3$ | 0.4 ppm | (0-40) ppm, (0-100)%Vol. |
| $CH_4$ | 10 ppm | (0-200)ppm, (0-100)%Vol. |
| $C_2H_2$ | 0.1 ppm | (0-10) ppm, (0-100)%Vol. |
| $C_2H_4$ | 0.6 ppm | (0-60)ppm, (0-100)%Vol. |

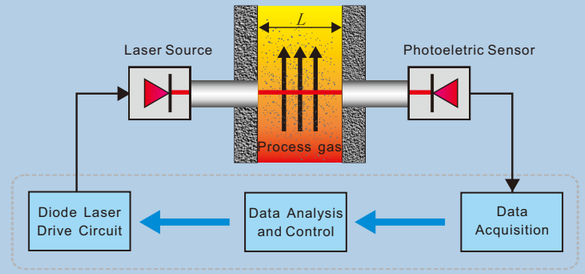
**Notes:** Listed are detection limits specified for 1m optical path at 20℃, 1 bar abs. Dual Gas CO+CO2, HCL+H2O are available for particular applications. Other gases and detailed measurement ranges may be available or customizable on request.

## CONFIGURATION

The transmitter portion of the LGA system 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 is composed of a photoelectric sensor, signal processing and purge control modules, is capable of signal processing and anti-explosion control.

## MEASURING PRINCIPLE

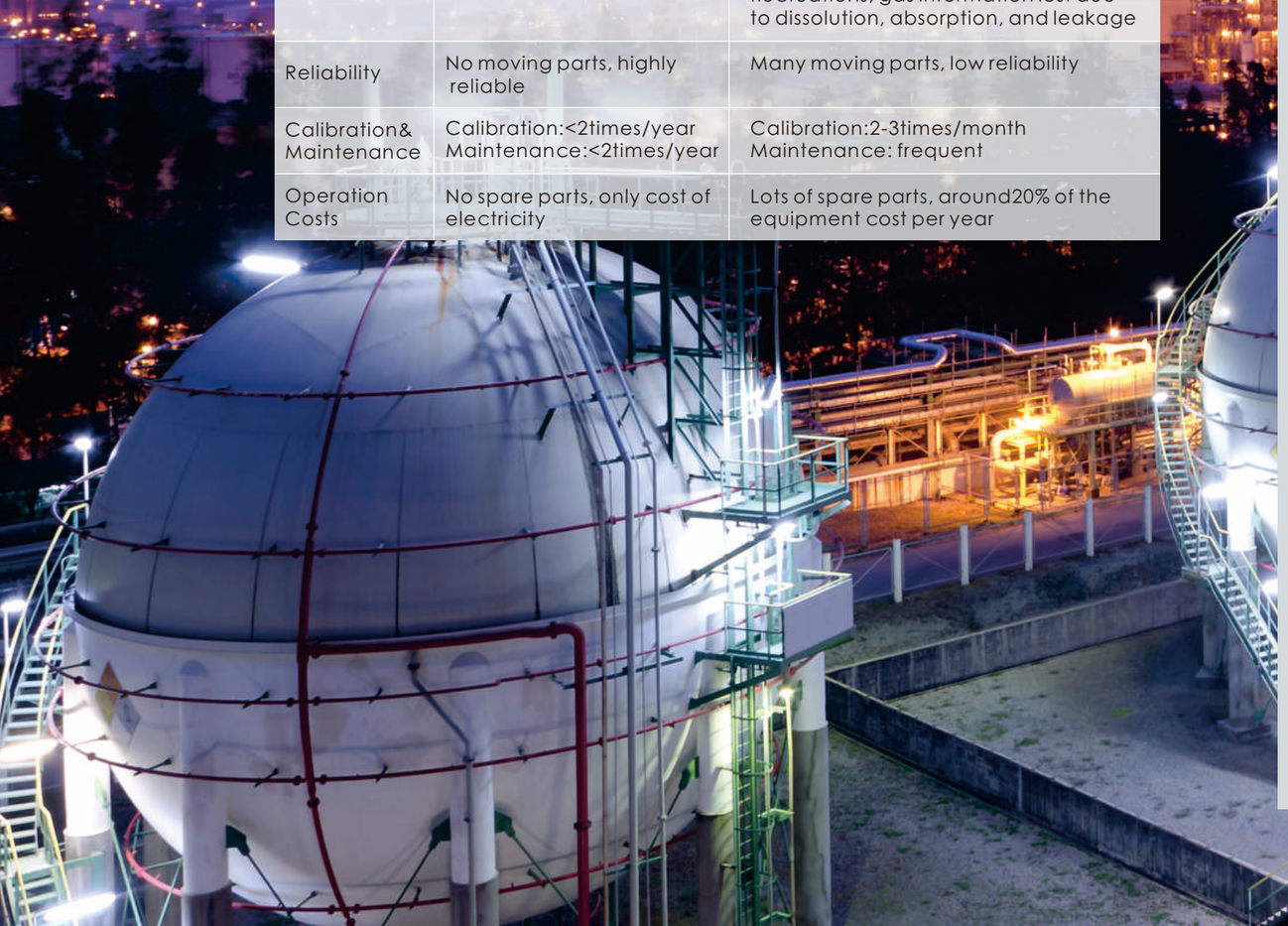
The laser beam from the transmitter unit passes across the stack or duct work and is absorbed by the measured gas. The attenuated light is then detected by the photoelectric sensor in the receiver unit, and the resulting signal is sent back to the transmitter unit and analyzed to yield gas concentration.




Measuring Principle Diagram

## TECHNOLOGY COMPARISON

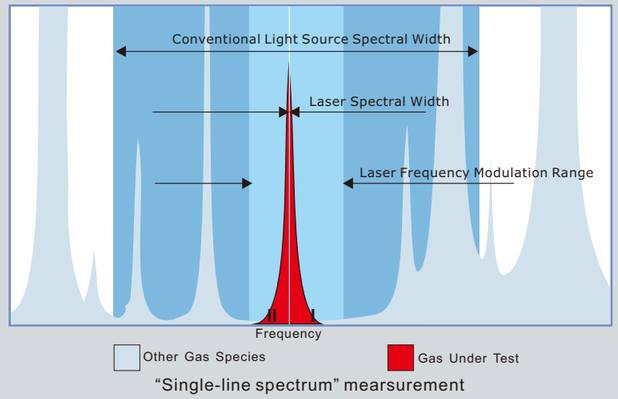
| ITEM | LGA LASER SYSTEM | CONVENTIONAL ONLINE ANALYSIS |
|---|---|---|
| Adaptability | Applicable to high temperature, pressure, moisture, dust density and corrosion | Applicable to constant temperature, pressure and dust free |
| Measurement | In-situ, continuous/real-time measurement; sample gas evacuation free | With sample conditioning system, discontinuous measurement |
| Response Time | Fast, only limited by electronics response, less than 1sec | 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 and absorption, and leaked 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:<2times/year Maintenance:<2times/year | Calibration:2-3times/month Maintenance: frequent |
| Operation Costs | No spare parts, only cost of electricity | Lots of spare parts, around20% of the equipment cost per year |



## TECHNICAL PRINCIPLE

### ■ No Cross Interference

The laser spectrum features excellent monochromaticity with spectral width down to 0.001nm, which is much narrower than spectral width of other light sources. By utilizing the 'Single-line' spectroscopy, a well-targeted laser spectrum can be sorted out to cover only the measuring gas without overlapping spectrum of all background gases.

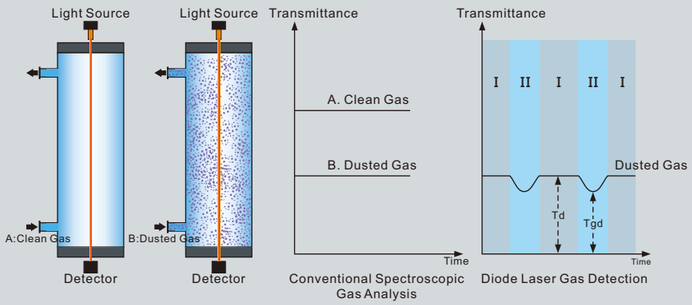


"Single-line spectrum" mearsurement

### ■ No Effects from Dust, Moisture and Window Contamination

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 uneffected by the gas absorption and gives Td, whereas Area II is effected and gives Tgd.

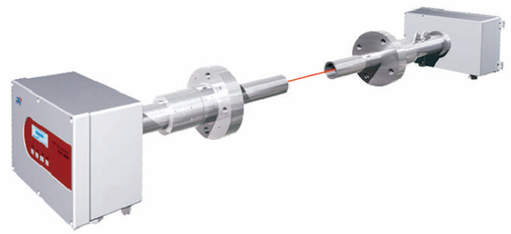
The transmittance of the gas under test is then calculated accurately by Tg=Tgd/Td. The interference from dust and optical window contamination is, therefore, automatically screened out.




### ■ Automatic Temperature & Pressure Compensation

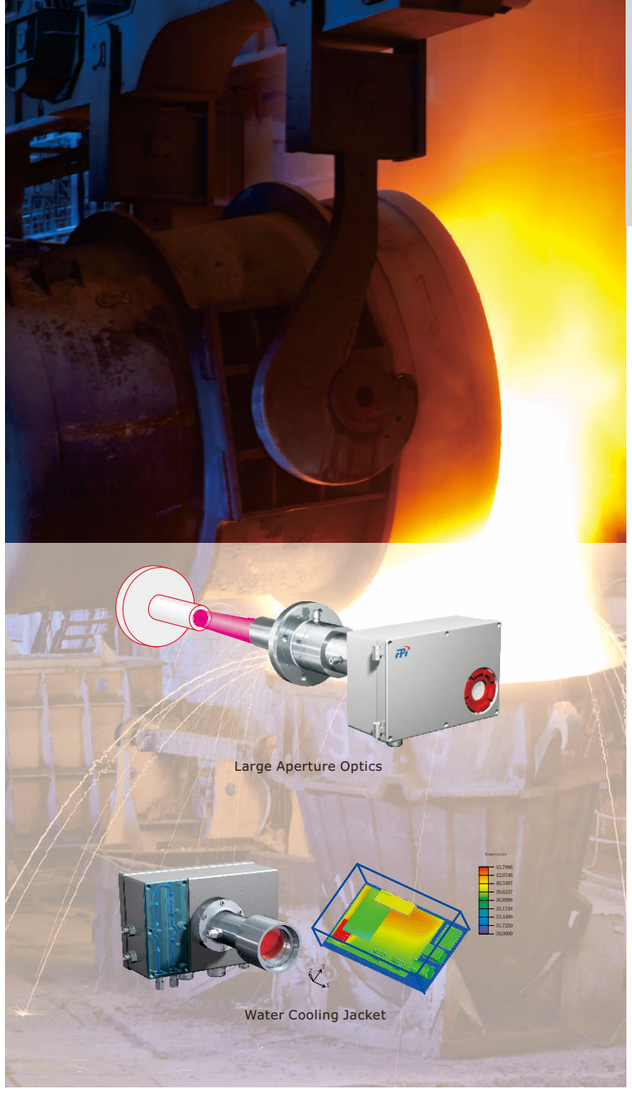
When gas temperature and pressure under measurement changes, the width and height of the absorption waveform change, which effects the accuracy of the measurement. By having 4-20mA process temperature and pressure input, the LGA system automatically compensates for them with a proprietary algorithm to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

# LGA-4100 In-situ



## Features and Benefits

- In-situ, no gas sampling
- No cross interference
- Fast response less than one second
- Diverse optical length (0.5~20m)
- Reliable in all harsh conditions: high temperature & pressure, dust density, moisture and corrosion
- Online calibration, no zero drift
- Thousands of tailor-made solutions for various applications
- International ATEX certified




## Application Areas

### Refinery & Petrochemical

- FCC Catalyst Regeneration
- SCR NH3 Injection
- Desulfurization Efficiency
- Explosive Process Gas
- Reactant Ratio Optimization
- Product Purity
- HCL, HF Emission
- Flue Gas Measurement Outlet of Process Heaters, Fractionators, Thermal Crackers, Utility Boilers and Incinerators
- Sulfur Recovery

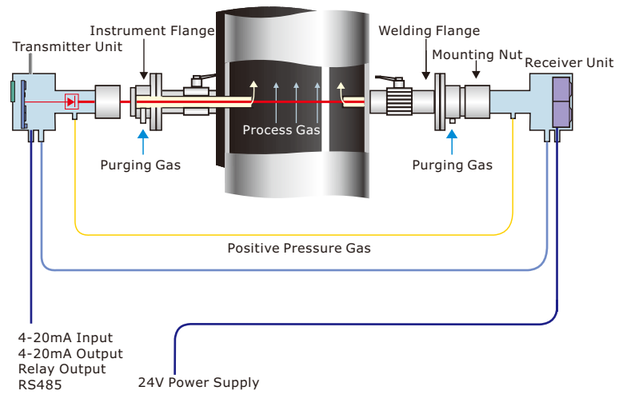
### Metallurgy

- Combustion Control for Reheating Furnace, Heat treatment Furnace, Forging Furnace
- Converter Gas Recycle
- Blast Furnace Gas
- Coke Oven Gas
- Flue Gas of Sintering, Pelletizing
- Coal Injection Safety Control
- Electric Tar Precipitator (ETP) Safety Control
- CDQ Circulating Gas
- Gas Tank Safety Control
- Calorific Value Analysis
- Sulfur Recovery

### Thermal Power

- SCR NH3 Injection
- Desulfurization Efficiency
- Coal Injection Safety Control
- HCL, HF Emission

## LGA Composition




## Technical Data

**Specifications**
Repeatability: ⩽ ± 1%F.S.
Linearity: ⩽ ± 1%F.S.
Span drift: ⩽ ± 1%F.S./6 months
Response time: ⩽ 1s(T90)
Warm-up time: ⩽ 15min
Optical path length: 0.5-20m
Process gas temperature: max. 1500°C
Process gas pressure: 0.8 to 4 bar abs.

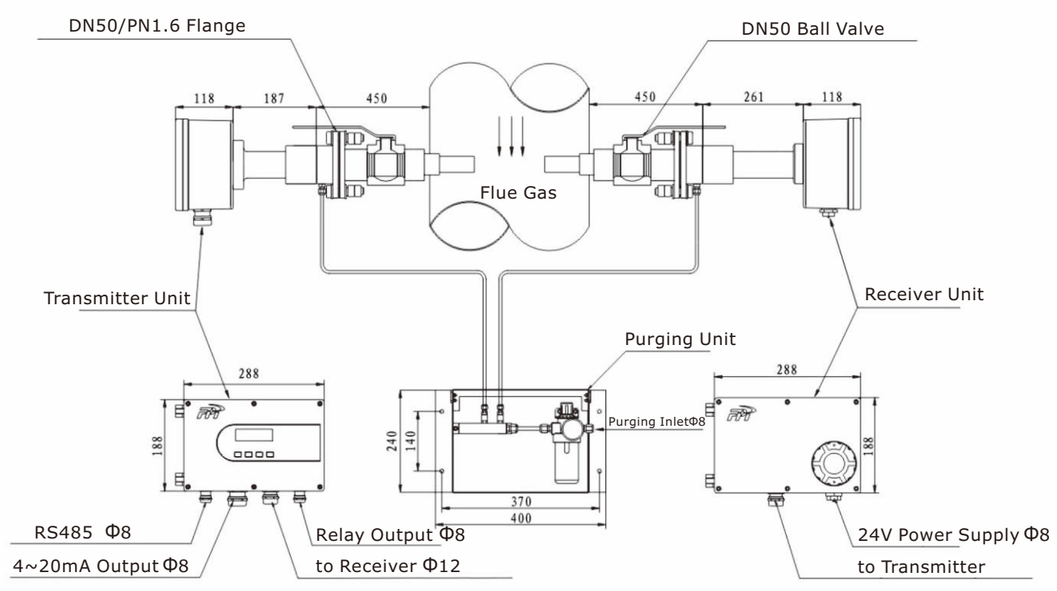
**Input & Outputs**
Analog outputs: 2 outputs 4-20mA, max. load 750Ω, electrically isolated
Relay outputs: 3 outputs 24V DC/1A
Analog inputs: 2 inputs 4-20mA, for gas temperature & pressure compensation
Communications: RS485(or Bluetooth, RS232 or GPRS )

**Operating conditions**
Power supply: 24V DC(21-36V DC), or 90-240V AC
Power consumption: max. 20W
Operating temperature: -30°C to +60°C
Storage temperature: -40°C to +80°C
Purge gas: 0.3 to 0.8MPa nitrogen gas or instrument air
Protection class: IP65

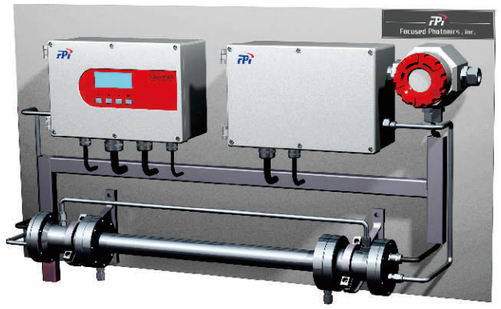
**Approvals**
Laser class: class 1 conformant with IEC60825-1
CE certified: conformant with 2004/108/EC
ATEX(IECEx) certified: Ex d op is pxIIC T5 Gb
CSA C/US Pending

## LGA Dimension

Unit:mm



# LGA-4500 Bypass



Corrosion resistant/high temperature proof gas cell

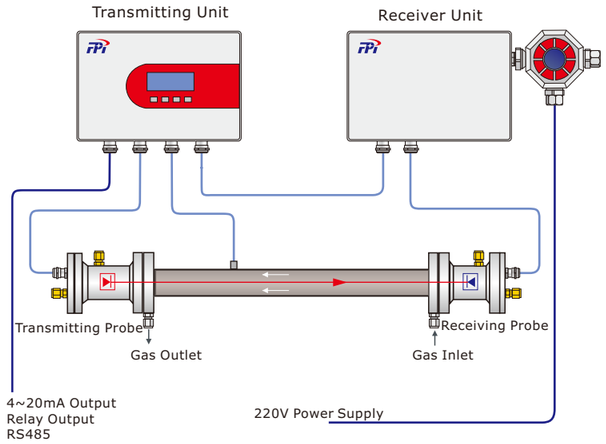
## Features and Benefits

- Fast response
- High accuracy, ppm level resolution
- No cross interference
- Reliable in all harsh conditions: high temperature & pressure, dust density, moisture and corrosion
- Online calibration, no zero drift
- International ATEX certified

## Application Areas

- Trace $H_2O$ in VCM Production
- Coal Injection Safety Control
- SCR $NH_3$ Injection in Coal-fueled Plants
- All other applications where in-situ doesn't fit due to high pressure or dust density, limitation of stack diameter or position.

## LGA Composition




## Technical Data

**Specifications**
Repeatability: ⩽± 1%F.S.
Linearity: ⩽± 1%F.S.
Span drift: ⩽± 1%F.S./6 months
Instrument response time: ⩽1s*
Warm-up time: ⩽15min
Gas cell temperature: -30°C to +250°C
Gas cell pressure: 0.5 to 3 bar abs.
*Gas flow>1L/min, system response time: T90⩽20s.

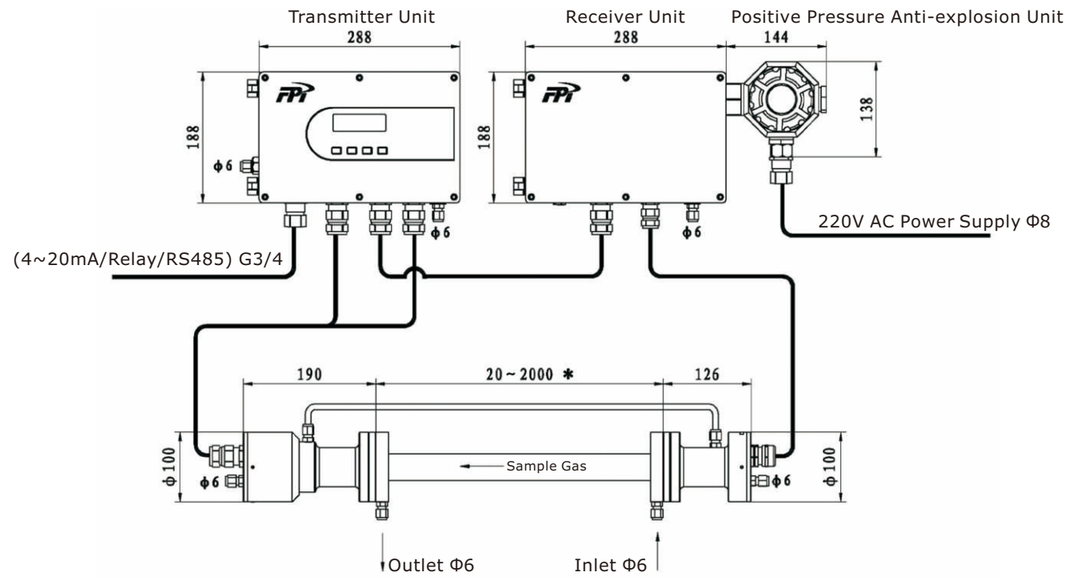
**Input & Outputs**
Analog outputs: 2 outputs 4-20mA, max. load 750Ω, electrically isolated
Relay outputs: 3 outputs 24V DC/1A
Communications: RS485(or Bluetooth, RS232 or GPRS )

**Operating Conditions**
Power supply: 200-240V AC/48-63Hz
Power consumption: ⩽30W (no heat tracing)
Operating temperature: -30°C to +60°C
Storage temperature: -40°C to +80°C
Purge gas: 0.3MPa nitrogen gas or instrument air
Protection class: IP65

**Approvals**
Laser class: class 1 conformant with IEC60825-1
CE certified: conformant with 2004/108/EC
ATEX(IECEx) certified: Ex d op is pxIIC T5 Gb
CSA C/US Pending

## LGA Dimension

Unit:mm



# LGA-4500IC Trace Level

## Features and Benefits

- Drift free, Maintenance free
- Accurate, real-time measurement
- No tape, No carrier gas, No light source or probe replacement
- No interference from glycol, methanol or amine
- Reliable in harsh conditions
- ATEX certified

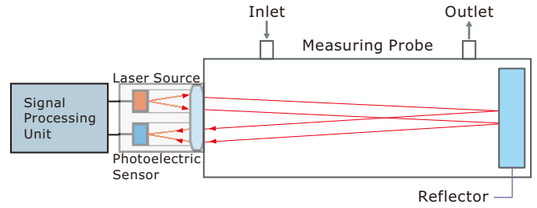
## Application Areas

- $H_2O$, $H_2S$ in natural gas
- Trace level $H_2O$, $H_2S$ in chemicals

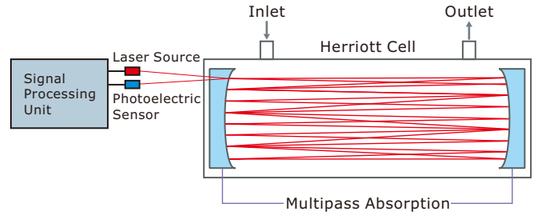
| Gas | Detection Limit | Measurement Range |
|---|---|---|
| $H_2O$ in natural gas | 2ppm | 0-100ppm |
| $H_2S$ in natural gas | 2ppm | 0-50ppm,0-200ppm |

## LGA Composition

For $H_2O$




For $H_2S$




## Technical Data

**Specifications ($H_2O$)**
Repeatability: ⩽ ±1%F.S.
Linearity: ⩽ ±1%F.S.
Span drift: ⩽ ±1%F.S./6 months
Instrument response time: ⩽1s*
Warm-up time: ⩽15min
Suggested gas flow: 1-5L/min
*Gas flow > 1L/min,system response time (short OPL 46cm): T90⩽11s,
system response time (long OPL 112cm): T90⩽21s.

**Specifications (H2S)**
Repeatability: ⩽ ±1%F.S.
Linearity: ⩽ ±1%F.S.
Span drift: ⩽ ±2%F.S./6 months
Instrument response time: ⩽3s*
Warm-up time: ⩽60min
Sample gas: dust/moisture/oil free (filtration ⩽0.5um)
Suggested gas flow: 1-5L/min
* Gas flow > 1L/min, system response time: T90⩽30s.

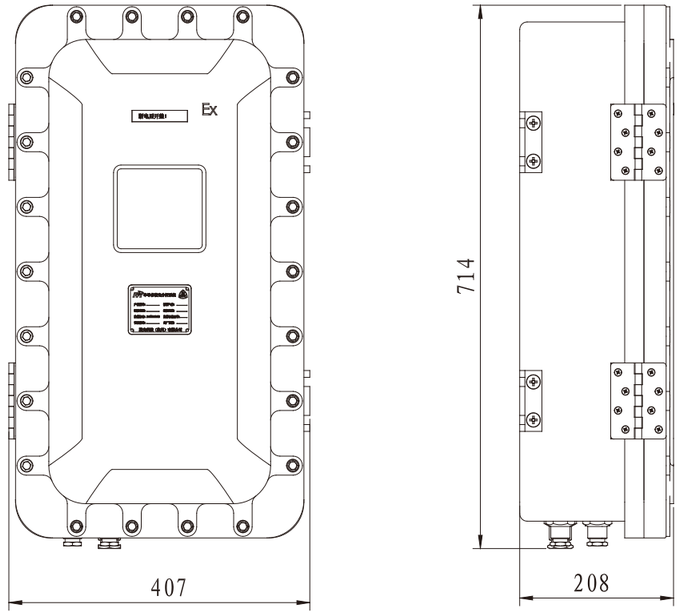
**Input & Outputs**
Analog outputs: 2 outputs 4-20mA, max. load 500Ω,
electrically isolated
Relay outputs: 3 outputs 24V DC/1A
Communications: RS485(or RS232/Modbus)

**Operating Conditions**
Power supply:100-240V AC($H_2O$), 200-240V AC($H_2S$)/48-63Hz
Power consumption: ⩽12W($H_2O$); ⩽450W($H_2S$)
Operating temperature: -20°C to +50°C
Protection class: Ip65

**Approvals**
Laser class: class 1 conformant with IEC60825-1
CE certified: conformant with 2004/108/EC
CSA C/US Pending

## LGA Dimension

Unit:mm



# LGA-C300 Calorific Value

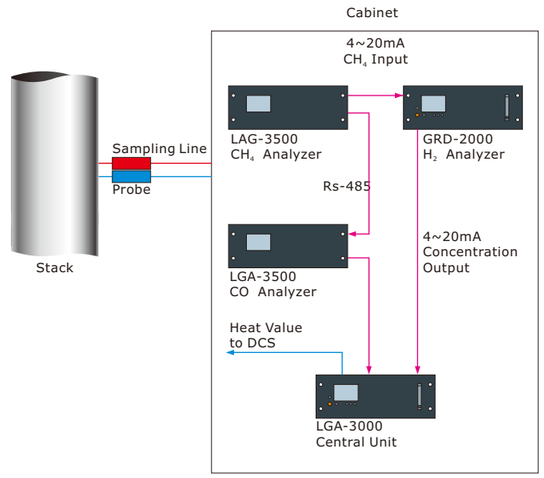
## Features and Benefits

- Integrated and compact
- Simultaneous and continuous multiple fuel compositions (CO, $CH_4$, $H_2$) analysis
- Low cost ownership and operation
- Reliable in harsh conditions

## Application Areas

- Calorific value analysis in iron&steel

## LGA Composition




## Technical Data

**CO: 0-100%***
**$CH_4$: 0-100%***
**$H_2$: 0-100%***
*** Measurement ranges (percentage) customizable on request.**

**Specifications**
Repeatability: ⩽±1% F.S.
Span drift: ⩽±2% F.S./3 months
Instrument response time: ⩽1s*
* Gas flow>1L/min, system response time: T90⩽21s.

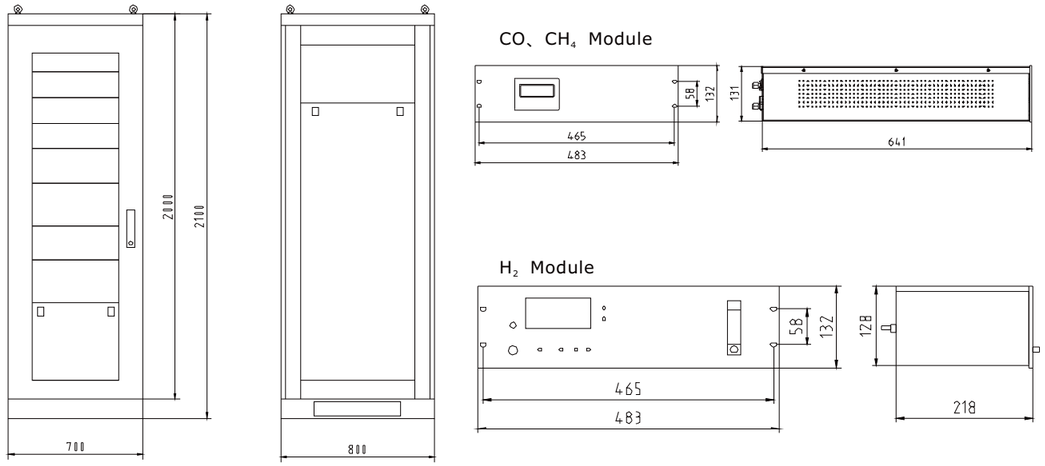
**Input & Outputs**
Analog outputs: 2 outputs 4-20mA, max. load 750Ω, electrically isolated
Communications: RS485/RS232

**Operating conditions**
Power supply: 100-240V AC/ 48-63Hz
Operating temperature: 0°C to +45°C

**Approvals**
Laser class: class 1 conformant with IEC60825-1
CSA C/US Pending

## LGA Dimension

Unit:mm



## Iron & Steel

**FPI Process Gas measurement in Iron & Steel**

| Process | Measuring Position | Gas Measured | Typical Range | Measuring Purpose | Instruments |
|---|---|---|---|---|---|
| Iron Making | **Sintering, Pelletizing** | | | | |
| | Sintering Flue Gas | $O_2$ | 0~21% | Combustion Optimizing, Energy Saving | LGA-4100 |
| | | CO | 0~5% | Safety Control | LGA-4100 |
| | | $CO_2$ | 0~15% | Combustion End-point Monitoring | LGA-4100 |
| | | $H_2O$ | 0~15% | Process Optimizing, Energy Saving | LGA-4100 |
| | | Fuel Calorific Value | | See 'Calorific Value Analysis' Forth Below | |
| | Pelletizing Flue Gas | $O_2$ | 0~15% | Combustion Optimizing, Energy Saving | LGA-4100 |
| | | CO | 0~15% | Safety Control | LGA-4100 |
| | | $CO_2$ | 0~15% | Combustion End-point Monitoring | LGA-4100 |
| | | $H_2O$ | 0~15% | Process Optimizing, Energy Saving | LGA-4100 |
| | | Fuel Calorific Value | | See 'Calorific Value Analysis' Forth Below | |
| | **Coal Injection Safety Control** | | | | |
| | Inlet of Coal Mill | $O_2$ | 0~21% | Safety Control | LGA-4100 |
| | | CO | 0~5000ppm | | LGA-4100 |
| | Outlet of Coal Mill | $O_2$ | 0~21% | | LGA-4500 |
| | | CO | 0~5000ppm | | LGA-4500 |
| | Outlet of Bag Filter | $O_2$ | 0~21% | | LGA-4100 |
| | | CO | 0~5000ppm | | LGA-4100 |
| | Coal Bunk | $O_2$ | 0~21% | | LGA-4500 |
| | | CO | (0~5000/0~2000)ppm | | LGA-4500 |
| | **Blast Furnace Gas** | | | | |
| | Flue Gas after Bag Filter | $O_2$ | 0~3% | Combustion Efficiency Control, Furnace Leakage Monitoring | LGA-4100 |
| | | $CH_4$ | 0~5% | | LGA-4100 |
| | | CO | 0~30%/0~50% | | LGA-4100 |
| | | $CO_2$ | 0~30%/0~50% | | LGA-4100 |
| | | $H_2$ | 0~10% | | GRD-2000 |
| | **Hot Blast Stove Flue Gas** | | | | |
| | Hot Blast Stove Flue Gas | $O_2$ | 0~21% | Process Optimizing, Energy Saving, Safety Control | LGA-4100 |
| | | CO | (0~2000/0~5000)ppm /0~5% | | LGA-4100 |
| Steel Making | **Converter Gas Recycle** | | | | |
| | Inlet or Outlet of Induced Draft Fan | CO | 0~100% | Gas Recycle Control | LGA-4100 |
| | Inlet or Outlet of Induced Draft Fan | $O_2$ | 0~5%/0~21% | | LGA-4100 |
| | Inlet or Outlet of Induced Draft Fan | $H_2$ | 0~10% | Condenser Operation Monitoring | GRD-2000 |
| | **Gas Tank Safety Control** | | | | |
| | Inlet & Outlet of Gas Tank | CO | 0~100% | Safety Control | LGA-4100 |
| | Inlet & Outlet of Gas Tank | $O_2$ | 0~5% | | LGA-4100 |
| | Flue Gas Before Electrostatic Precipitator(ESP) | CO | 0~100% | | LGA-4100 |
| | Flue Gas Before Electrostatic Precipitator(ESP) | $O_2$ | 0~5% | | LGA-4100 |
| Coking | **Electric Tar Precipitator (ETP) Safety Control** | | | | |
| | ETP Outlet | $O_2$ | 0~5%/0~1% | Safety Control | LGA-4100 |
| | Coke Oven Exhaust Gas | $O_2$ | 0~10%/0~5%/0~1% | Combustion Optimizing, Energy Saving | LGA-4100 |
| | **Coke Oven Gas** | | | | |
| | Inlet of Desulfurization | $H_2S$ | 0~2000ppm | Desulfurization Efficiency Control | LGA-4100 |
| | Outlet of Desulfurization | $H_2S$ | 0-500mg/$Nm^3$ | | LGA-4500IC |
| | **CDQ Circulating Gas** | | | | |
| | CDQ | $O_2$ | 0~5% | Process Optimizing, Safety Control | LGA-4100 |
| | CDQ | CO | 0~20% | | LGA-4100 |
| | CDQ | $Co_2$ | 0~30% | | LGA-4100 |
| | CDQ | $CO/CO_2$ | 0~20%/0~30% | | LGA-4100 |
| | CDQ | $H_2$ | 0~10%/0~20% | | GRD-2000 |
| | **Claus Sulfur Recovery** | | | | |
| | Acid Gas | $H_2S$ | 0-100% | H2S:Air Proportioning, Reaction Optimizing | LGA-4100 |
| | Outlet of Catalytic Reactor | $H_2S/SO_2$ | 0-1%/0-2% | H2S:SO2 Ratio, Reaction Optimizing | OMA-2000 |
| | **Claus Exhaust Gas Cleaning** | | | | |
| | Outlet of Sulfur Condenser | $H_2$ | 0~5% | Oxidization Control | GRD-2000 |
| | Outlet of Tail Gas Scrubber | $H_2S$ | 0~1% | Scrubbing Efficiency Monitoring | LGA-4100 |
| | Outlet of Incinerator | $O_2$ | 0~5% | Combustion Optimizing, Energy Saving | LGA-4100 |
| | Chimney | $SO_2$ | (0~2000/0~1000)ppm | Emission Monitoring | CEMS-2000 |
| Hot Rolling | **Reheating Furnace** | | | | |
| | in-situ on Furnace | $O_2$ | 0~21% | Burning Loss Control | LGA-4100 |
| | in-situ on Furnace | CO | 0~2%/0~5% | Process Optimizing, Energy Saving | LGA-4100 |
| Calorific Value | **Calorific Value Analysis** | | | | |
| | Converter Gas/Blast Furnace Gas | CO | 0~60% | Fuel Gas Proportioning, Cost Accounting | LGA-4100 |
| | Coke Oven Gas | CO | 0~20% | | LGA-C300 |
| | | $CH_4$ | 0~60% | | |
| | | $H_2$ | 0~60% | | |
| | Mixed Gas | CO | 0~40% | | LGA-C300 |
| | | $CH_4$ | 0~60% | | |
| | | $H_2$ | 0~40% | | |
| | Blast Furnace Gas | CO | 0~50% | | LGA-C300 |
| | | $H_2$ | 0~10% | | |
| Others | Industrial boilers/calciners | $O_2$ | 0~5%/0~1% | Process Optimizing, Safety Control | Specifications |
| | | CO | 0~5%/0~1% /(0~5000/0~2000)ppm | | |

## Oil&Gas

**FPI Process Gas measurement in Oil & Gas**

| Industry | Application | Measuring Position | Objects to measure | Instruments |
|---|---|---|---|---|
| Oil Refining | FCC | Outlet of Regenerator | CO,$CO_2$, $O_2$ | LGA-4100 |
| | Hydrogen Production | Process gases | CO, $CO_2$, $C_2H_4$ | LGA-4500 |
| | Sulfur recovery | Feedstock gas | $H_2S$ | OMA-3120/LGA-4500 |
| | | Outlet of Claus Reactor | $H_2S/SO_2$ | OMA-3510 |
| | | Outlet of Condenser | $H_2$ | TAI-2020 |
| | | Exhaust gas incineration | $SO_2$ | OMA-3110 |
| | | Emission gas | $SO_2$,$H_2S$,$O_2$,particulate, velocity | CEMS-2000,LGA-4100 |
| Petrochemical | Ethylene Cracking | Outlet of cracking furnace | CO, $Co_2$, $C_2H_2$ | LGA-4100/4500, PGC |
| | PTA | Process gases | $O_2$, CO, $Co_2$, $H_2O$, $CH_3COOH$ | LGA-4100/4500, SUPNIR |
| | EO/EG | Process gases | $O_2$, $Co_2$, $CH_4$, $C_2H_4$, $C_2H_4$, EO, Ar, $N_2$ | MGA, LGA-4500 |
| | PE | Process gases | CO, $CO_2$,$C_2H_4$, $C_2H_4$, $O_2$, trace $H_2O$ | LGA-4500, TAI-2000/8800 |
| | PP | Process gases | CO, $CO_2$, $C_3H_6$, $C_3H_8$, $H_2$, $C_4H_8$, $C_4H_9CL$, Trace $H_2O$, $O_2$ | LGA-4500, TAI-2000/8800/3020T |
| | PS | Process gases | $O_2$, CO/$CO_2$, Trace $H_2O$ in Benzene | LGA-4500 |
| Chemical | PVC (VCM) | Feedstock C2H4 | $H_2O$, $O_2$ in $C_2H_4$ | LGA-4500 |
| | | Feedstock Cl2 | $O_2$, trace $H_2O$ in $Cl_2$ | LGA-4500 |
| | | EDC gas | $Cl_2$, Trace $H_2O$ in EDC | OMA-3010, LGA-4500 |
| | | Recycle gas | $O_2$, CO, $CO_2$, $C_2H_4$ | LGA4500/4100 |
| | | HCL stripping | $O_2$ in HCL | LGA-4500 |
| | Methanol Ammonia Synthesis Urea Synthesis | Process gases | $O_2$, CO, $CO_2$, $NH_3$ | LGA-4500/4100 |
| | Hydrogen Peroxide | Oxidation | $O_2$ | LGA-4100 |
| | Sulfuric Acid | Feedstock gas | $SO_2$ | OMA-3110 |
| DeNOx | SCR outlet | | $NH_3$ slip | LGA-4500/4100 |
| | Emission stack | | NOx, $SO_2$, $O_2$, CO, $CO_2$ | CEMS-2000 |
| Natural Gas | Extraction | Raw gas | High $H_2S$, $CO_2$ | LGA-4500PA (portable) |
| | Purification | Acid gas removing | High $H_2S$ | LGA-4500 |
| | | Sulfur recovery exhaust gas | $H_2S/SO_2$ | OMA-3510 |
| | | Exhaust gas treatment | $SO_2$ | OMA-3110 |
| | | Purified gas | Trace $H_2S$, $H_2O$ | LGA-4500IC |
| | Transportation | Pipelines and stations | Trace $H_2S$, $H_2O$ | LGA-4500IC |
| | Compression | CNG | Trace $H_2S$, $H_2O$ | LGA-4500IC |

## Other Applications

**FPI Process Gas measurement in Various Applications**

| Industry | Measuring Position | Gas Measured | Measuring Purpose | Instruments |
|---|---|---|---|---|
| Waste Incineration | Incinerator | $O_2$, CO | Incinerator Combustion Control | LGA-4100 |
| | Outlet of Acid Scrubber | HCL, HF | Input Control of Calcium Hydroxide | LGA-4100 |
| | Outlet of Bag House Filter | HCL, HF | Filter Efficiency Control | LGA-4100 |
| | Outlet of SCR Reactor | $NH_3$ | $NH_3$ Injection Control and $NH_3$ Slip Detection | LGA-4100 |
| | Stack Inlet | HCL+$H_2O$ | Dry HCL Exhaust | LGA-4100 |
| | | $SO_2$, NOx, $O_2$, CO, $Co_2$, Dust, TPF | Emission Monitoring | CEMS-2000B |
| Thermal Power | Inlet of SCR Reactor | NOx, $O_2$ | Flue gas Monitoring | CEMS-2000B |
| | Outlet of SCR Reactor | NOx, $O_2$, Dust, TPF, Humidity | | CEMS-2000B |
| | Outlet of SCR Reactor | $NH_3$ | $NH_3$ Injection Control and $NH_3$ Slip Detection | LGA-4100 |
| | Inlet of Desulfurization Reactor | $SO_2$, $O_2$, Velocity, Humidity | Desulfurization Efficiency Control | CEMS-2000B |
| | Outlet of Desulfurization Reactor | $SO_2$, NOx, $O_2$, Dust, TPF, Humidity | | CEMS-2000B |
| | Chimney | $SO_2$, NOx, $O_2$, Dust, TPF, Humidity | Emission Monitoring | CEMS-2000B |
| | Inlet of Coal Mill | $O_2$, CO | Safety Control | LGA-4100 |
| | Outlet of Coal Mill | $O_2$, CO | | LGA-4500 |
| | Outlet of Bag Filter | $O_2$, CO | | LGA-4100 |
| | Coal Bunk | $O_2$, CO | | LGA-4500 |
| Cement | Kiln Outlet | $O_2$, CO, $CO_2$ | Combustion Optimizing | LGA-4100 |
| | Outlet of Preheater Tower | $O_2$, CO, $CO_2$ | Process Optimizing | LGA-4100 |
| | Inlet of Coal Mill | $O_2$, CO | Safety Control | LGA-4100 |
| | Outlet of Coal Mill | $O_2$, CO | | LGA-4500 |
| | Outlet of Bag Filter | $O_2$, CO | | LGA-4100 |
| | Coal Bunk | $O_2$, CO | | LGA-4500 |