



LGA series

PROCESS LASER GAS ANALYSIS SYSTEM

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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	0.5 ppm	(0-60)ppm, (0-100)%Vol.
CO ₂	1.5 ppm	(0-150)ppm, (0-100)%Vol.
H ₂ O	0.3 ppm	(0-30)ppm, (0-100)%Vol.
NH ₃	0.1 ppm	(0-10) ppm, (0-100)%Vol.
HCl	0.2 ppm	(0-50) ppm, (0-100)ppm.
HF	0.1 ppm	(0-10)ppm, (0-1,000) ppm.
H ₂ S	0.01 ppm	(0-50) ppm, (0-100)%Vol.
CH ₄	10 ppm	(0-200)ppm, (0-100)%Vol.
C ₂ H ₂	0.1 ppm	(0-10) ppm, (0-100)%Vol.
C ₂ H ₄	0.6 ppm	(0-60)ppm, (0-100)%Vol.
HCN	0.3 ppm	(0-30)ppm, (0-10,000)ppm.

Notes: Listed are detection limits specified for 1m optical path at 20°C, 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.

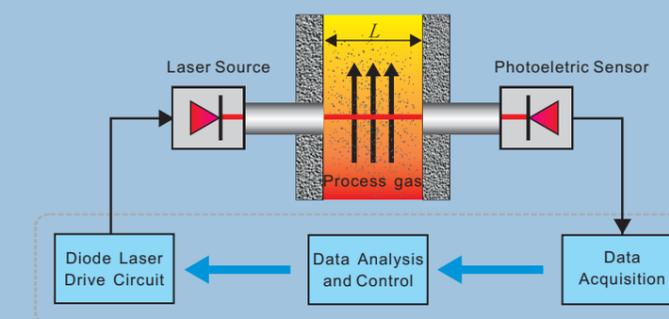


CONFIGURATION

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

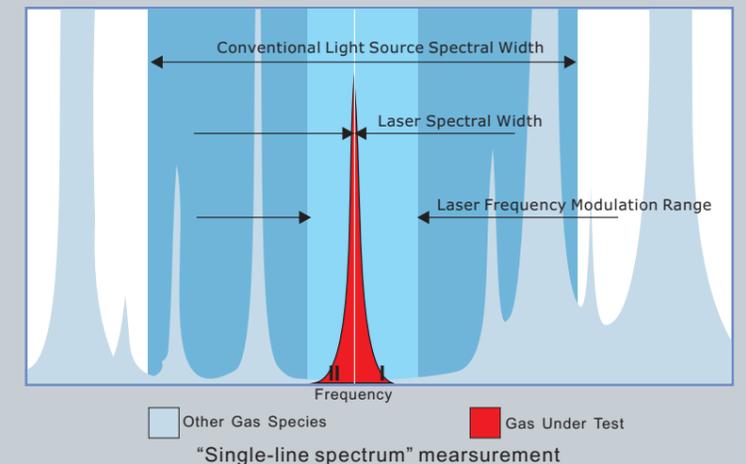
TECHNOLOGY COMPARISON

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

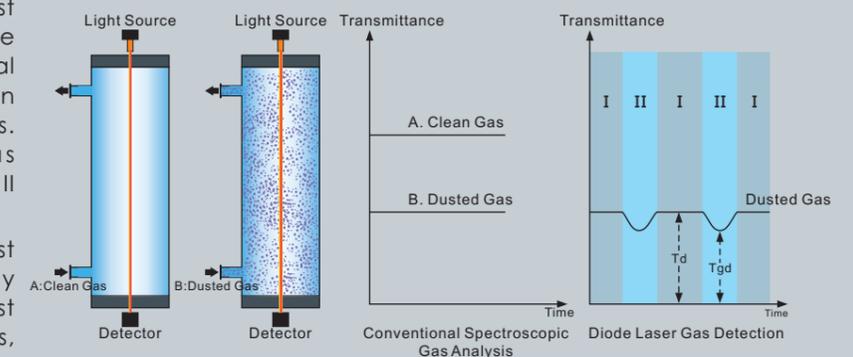
The laser spectrum features excellent monochromaticity with spectral width down to 0.001nm, which is much narrower than spectral width of other light sources. By utilizing the 'Single-line' spectroscopy, a well-targeted laser spectrum can be sorted out to cover only the measuring gas without overlapping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



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 unaffected by the gas absorption and gives T_d , whereas Area II is effected and gives T_{gd} .

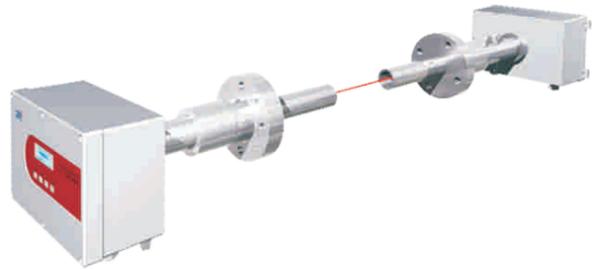
The transmittance of the gas under test is then calculated accurately by $T_g = T_{gd}/T_d$. The interference from dust and optical window contamination is, therefore, automatically screened out.



Automatic Temperature & Pressure Compensation

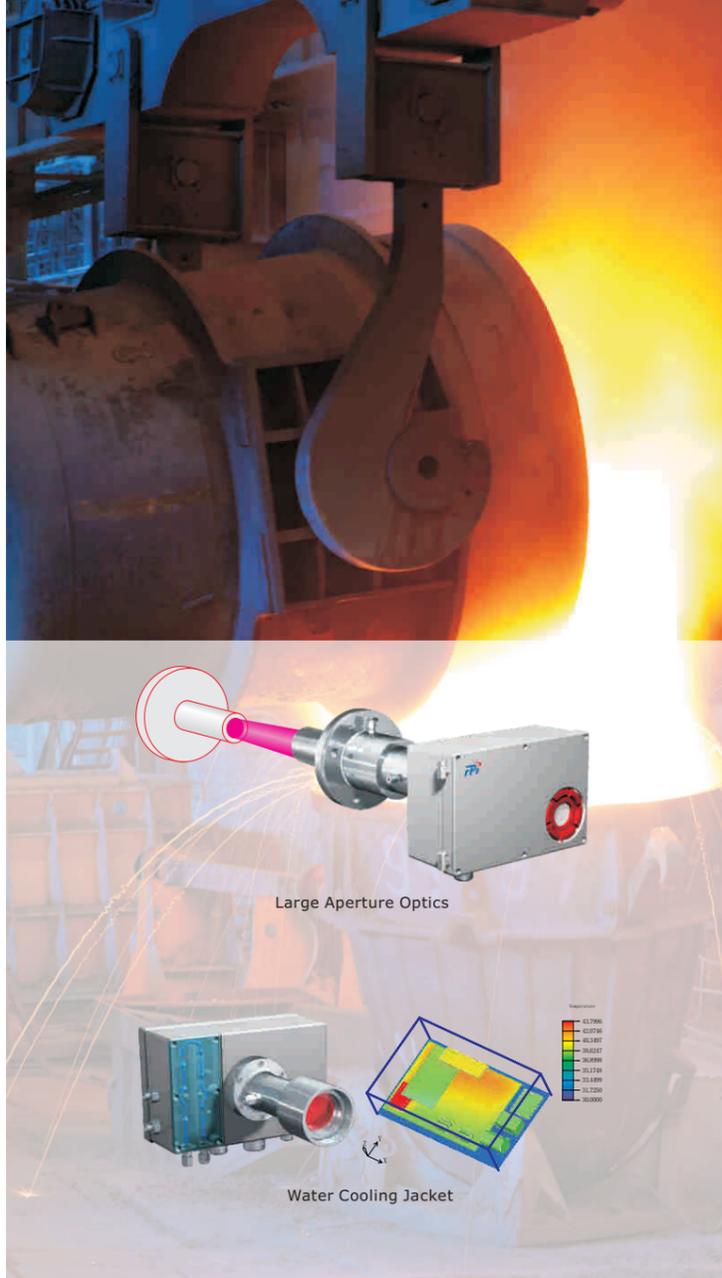
When gas temperature and pressure under measurement changes, the width and height of the absorption waveform change, which effects the accuracy of the measurement. By having 4-20mA process temperature and pressure input, the LGA system automatically compensates for them with a proprietary algorithm to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

Technical Data

Specifications

- Repeatability: $\leq \pm 1\%F.S.$
- Linearity: $\leq \pm 1\%F.S.$
- Span drift: $\leq \pm 1\%F.S./6$ months
- Response time: $\leq 1s(T90)$
- Warm-up time: $\leq 15min$
- 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)

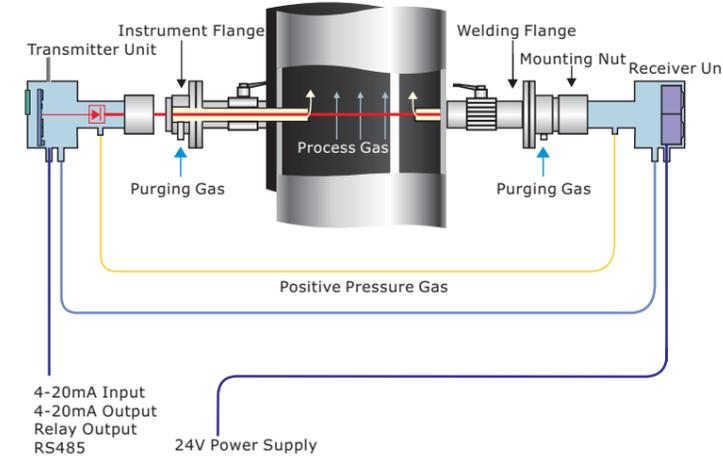
Operating conditions

- 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

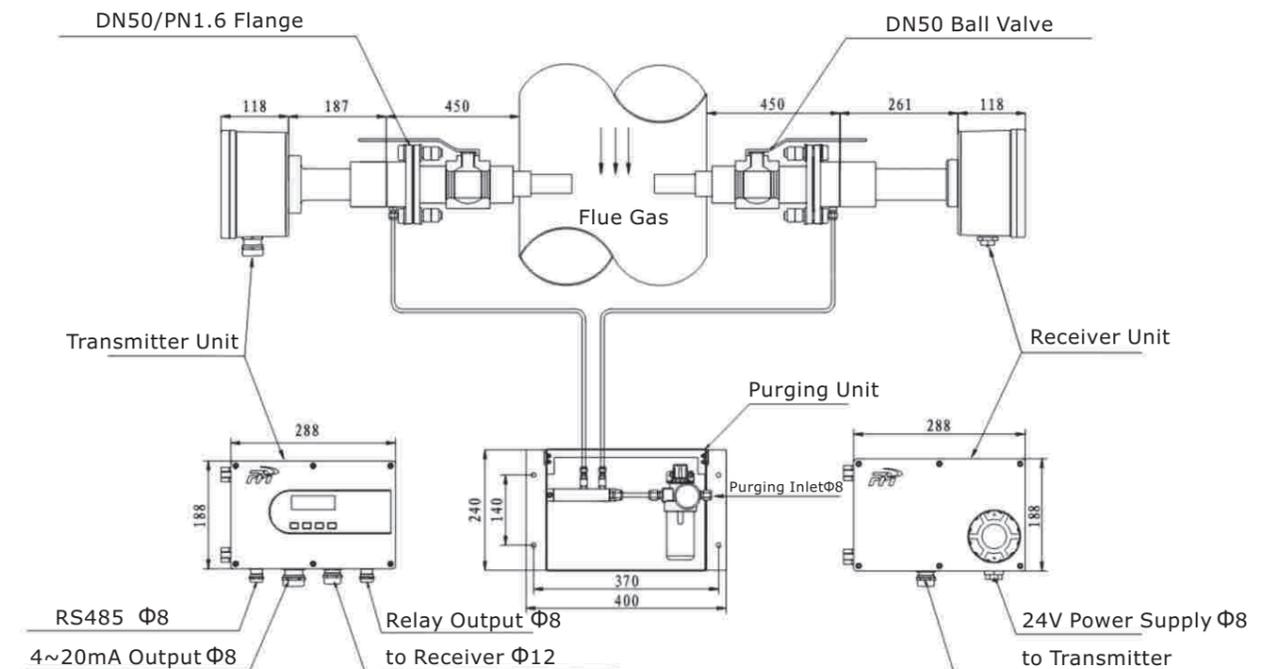
- Laser class: class 1 conformant with IEC60825-1
- CE certified: conformant with 2004/108/EC
- IECEX certified: IECEX CQM 13.0047X
- ATEX certified: ECM 15 ATEX-B 003 X

LGA Composition



LGA Dimension

Unit:mm



LGA-4500 Bypass



Corrosion resistant/high temperature proof gas cell

Features and Benefits

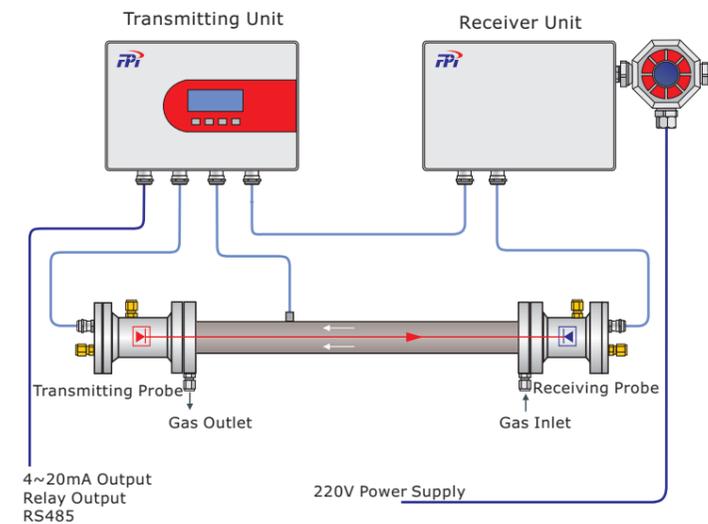
- Fast response
- High accuracy, ppm level resolution
- No cross interference
- Reliable in all harsh conditions: high temperature & pressure, dust density, moisture and corrosion
- Online calibration, no zero drift
- International ATEX certified

Application Areas

- HCL, HF, NH₃, H₂S emission monitoring
- Trace H₂O in VCM Production
- Coal Injection Safety Control
- SCR NH₃ 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: $\leq \pm 1\%F.S.$
 Linearity: $\leq \pm 1\%F.S.$
 Span drift: $\leq \pm 1\%F.S./6$ months
 Instrument response time: $\leq 1s^*$
 Warm-up time: $\leq 15min$
 Gas cell temperature: $-30^{\circ}C$ to $+250^{\circ}C$
 Gas cell pressure: 0.5 to 3 bar abs.
 *Gas flow $> 1L/min$, system response time: $T_{90} < 20s.$

Input & Outputs

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

Operating Conditions

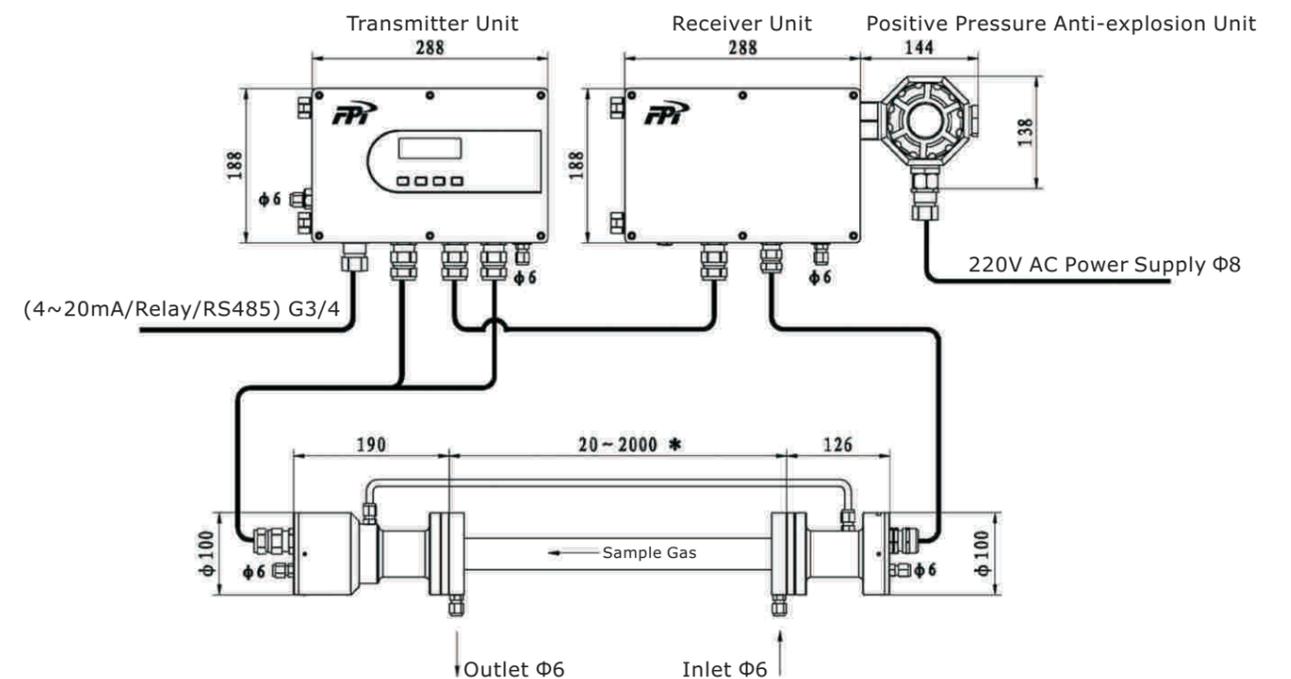
Power supply: 200-240V AC/48-63Hz
 Power consumption: $\leq 30W$ (no heat tracing)
 Operating temperature: $-30^{\circ}C$ to $+60^{\circ}C$
 Storage temperature: $-40^{\circ}C$ to $+80^{\circ}C$
 Purge gas: 0.3MPa nitrogen gas or instrument air
 Protection class: IP65

Approvals

Laser class: class 1 conformant with IEC60825-1
 CE certified: conformant with 2004/108/EC

LGA Dimension

Unit:mm





LGA-4500IC Trace Level

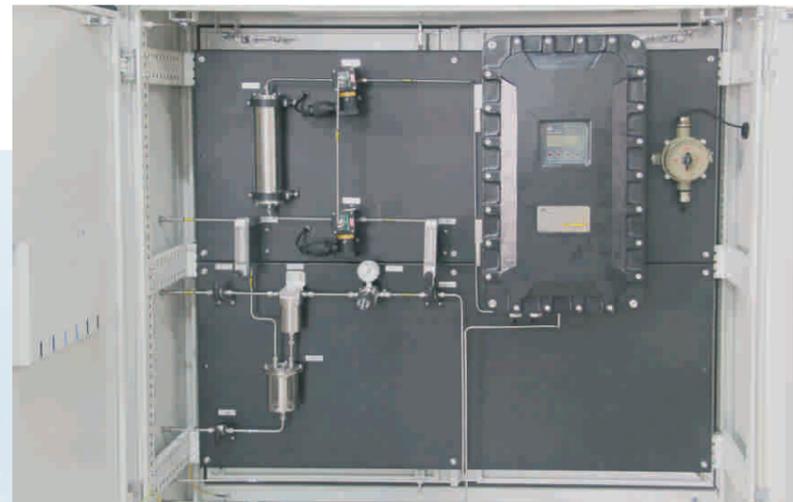
Features and Benefits

- 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

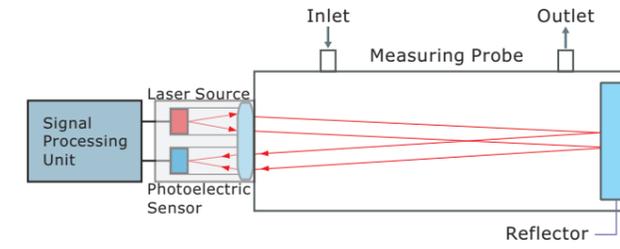
- H₂O, H₂S in natural gas
- Trace level H₂O, H₂S in chemicals

Gas	Detection Limit	Measurement Range
H ₂ O in natural gas	2ppm	0-100ppm
H ₂ S in natural gas	2ppm	0-50ppm, 0-200ppm

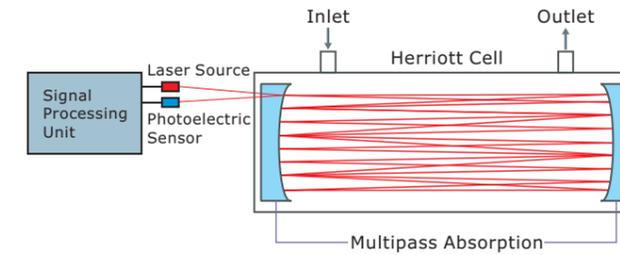


LGA Composition

For H₂O



For H₂S



Technical Data

Specifications (H₂O)

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

Specifications (H₂S)

Repeatability: $\leq \pm 1\%F.S.$
 Linearity: $\leq \pm 1\%F.S.$
 Span drift: $\leq \pm 2\%F.S./6$ months
 Instrument response time: $\leq 3s^*$
 Warm-up time: $\leq 60min$
 Sample gas: dust/moisture/oil free (filtration $\leq 0.5\mu m$)
 Suggested gas flow: 1-5L/min
 * Gas flow > 1L/min, system response time: T90 $\leq 30s$.

Input & Outputs

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

Operating Conditions

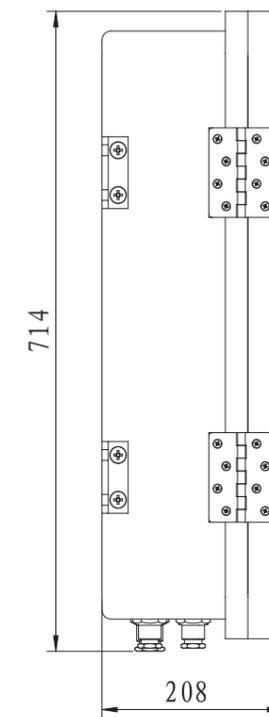
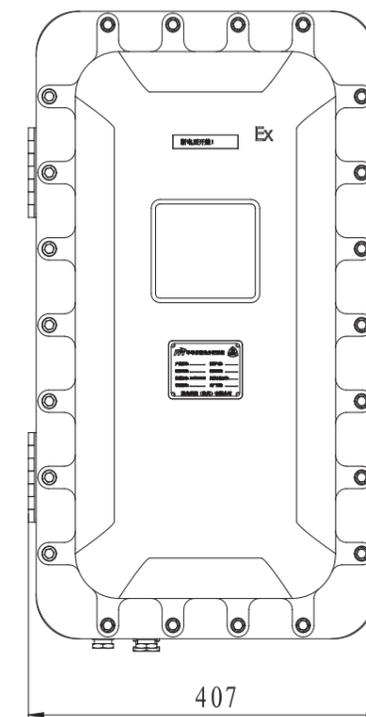
Power supply: 100-240V AC(H₂O), 200-240V AC(H₂S)/48-63Hz
 Power consumption: $\leq 12W(H_2O)$; $\leq 450W(H_2S)$
 Operating temperature: -20°C to +50°C
 Protection class: Ip65

Approvals

Laser class: class 1 conformant with IEC60825-1
 CE certified: conformant with 2004/108/EC

LGA Dimension

Unit:mm



LGA-C300 Calorific Value



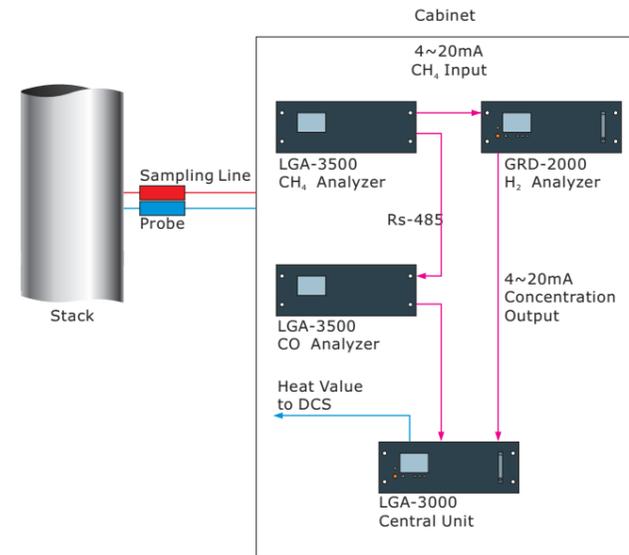
Features and Benefits

- Integrated and compact
- Simultaneous and continuous multiple fuel compositions (CO, CO₂, CH₄, H₂) analysis
- Low cost ownership and operation
- Reliable in harsh conditions

Application Areas

- Calorific value analysis in iron&steel
- Syngas analysis

LGA Composition



Technical Data

- CO: 0-100%*
- CO₂: 0-100%*
- CH₄: 0-100%*
- H₂: 0-100%*

* Measurement ranges (percentage) customizable on request.

Specifications

- Repeatability: $\leq \pm 1\%$ F.S.
- Span drift: $\leq \pm 2\%$ F.S./3 months
- Instrument response time: $\leq 1s^*$
- * Gas flow > 1L/min, system response time: T90 $\leq 21s$.

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

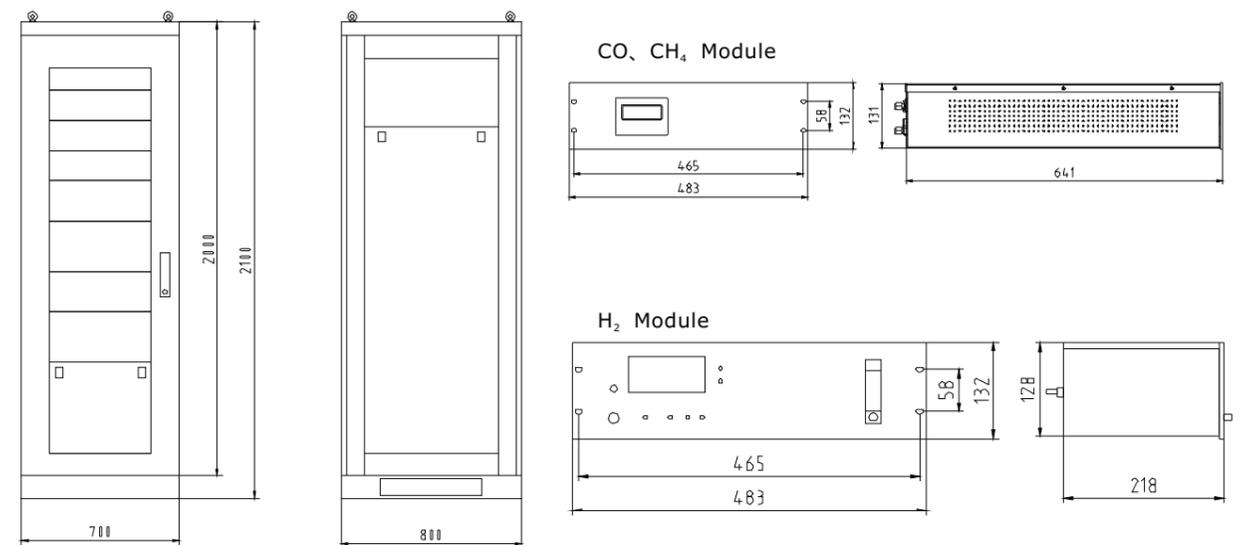
- Laser class: class 1 conformant with IEC60825-1

TECHNOLOGY COMPARISON

Items	Combustion based CV Analyzers	FPI's LGA-C300
Key component	Automatic ignition device, is prone to be disturbed by gas flow, pressure and gas source.	Spectrometer based, on-line and continuous.
Calibration gas	Gas proportion dependent, complex and less accurate.	Standard cylinder gas.
Reliability	5 steps: sampling, ignition, combustion, heat exchange and vent, more moving parts.	3 steps: sampling, measure and vent, less moving parts.
Safety	Open flame	No flame, no chemical reaction.
Response time	Slow. Limited by combustion and heat exchange.	$\leq 21s$
Consuming parts	Pressure regulator, igniter, heat exchanger, etc.	No consuming parts.
Output	Calorific Value and Wobbe Index. No indication of gas composition changing.	Calorific Value and CO, CH ₄ , H ₂ concentration, real quantitative detection.

LGA Dimension

Unit:mm



Iron & Steel

FPI Process Gas measurement in Iron & Steel						
Process	Measuring Position	Gas Measured	Typical Range	Measuring Purpose	Instruments	
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 ₂ O	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 ₂ O	0~15%	Process Optimizing, Energy Saving	LGA-4100	
		Fuel Calorific Value		See 'Calorific Value Analysis' Forth Below		
Coal Injection Safety Control						
Iron Making	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%	Safety Control	LGA-4500	
		CO	0~5000ppm		LGA-4500	
	Outlet of Bag Filter	O ₂	0~21%	Safety Control	LGA-4100	
		CO	0~5000ppm		LGA-4100	
	Coal Bunk	O ₂	0~21%	Safety Control	LGA-4500	
		CO	(0~5000/0~2000)ppm		LGA-4500	
Blast Furnace Gas						
Iron Making	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						
Iron Making	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	
Converter Gas Recycle						
Steel Making	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		
Electric Tar Precipitator (ETP) Safety Control						
Steel Making	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						
Steel Making	Inlet of Desulfurization	H ₂ S	0~2000ppm	Desulfurization Efficiency Control	LGA-4100	
	Outlet of Desulfurization	H ₂ S	0~500mg/Nm ³		LGA-4500IC	
CDQ Circulating Gas						
Coking	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						
Coking	Acid Gas	H ₂ S	0~100%	H ₂ S:Air Proportioning, Reaction Optimizing	LGA-4100	
	Outlet of Catalytic Reactor	H ₂ S/SO ₂	0~1%/0~2%	H ₂ S:SO ₂ Ratio, Reaction Optimizing	OMA-2000	
Claus Exhaust Gas Cleaning						
Coking	Outlet of Sulfur Condenser	H ₂	0~5%	Oxidization Control	GRD-2000	
	Outlet of Tail Gas Scrubber	H ₂ S	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	
Reheating Furnace						
Hot Rolling	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 Analysis						
Calorific Value	Converter Gas/Blast Furnace Gas	CO	0~60%	Fuel Gas Proportioning, Cost Accounting	LGA-4100	
		CO	0~20%		LGA-4100	
	Coke Oven Gas	CH ₄	0~60%	Fuel Gas Proportioning, Cost Accounting	LGA-C300	
		H ₂	0~60%		LGA-C300	
	Mixed Gas	CO	0~40%	Fuel Gas Proportioning, Cost Accounting	LGA-C300	
		CH ₄	0~60%		LGA-C300	
	Blast Furnace Gas	H ₂	0~40%	Fuel Gas Proportioning, Cost Accounting	LGA-C300	
		CO	0~50%		LGA-C300	
	Others	Industrial boilers/calciners	O ₂	0~10%	Process Optimizing, Safety Control	LGA-4100
			CO	0~5%/0~1% / (0~5000/0~2000)ppm		Specifications

Oil & Gas

FPI Process Gas measurement in Oil & Gas					
Industry	Application	Measuring Position	Objects to measure	Instruments	
Oil Refining	FCC Hydrogen Production	Outlet of Regenerator	CO, CO ₂ , O ₂	LGA-4100	
		Process gases	CO, CO ₂ , C ₂ H ₄	LGA-4500	
	Sulfur recovery	Feedstock gas	H ₂ S	OMA-3120/LGA-4500	
		Outlet of Claus Reactor	H ₂ S/SO ₂	OMA-3510	
		Outlet of Condenser	H ₂	TAI-2020	
Petrochemical	Ethylene Cracking	Exhaust gas incineration	SO ₂	OMA-3110	
		Emission gas	SO ₂ , H ₂ S, O ₂ , particulate, velocity	CEMS-2000, LGA-4100	
	PTA	Outlet of cracking furnace	CO, CO ₂ , C ₂ H ₂	LGA-4100/4500, PGC	
		Process gases	O ₂ , CO, CO ₂ , H ₂ O, CH ₃ COOH	LGA-4100/4500, SUPNIR	
	EO/EG	Process gases	O ₂ , CO ₂ , CH ₄ , C ₂ H ₄ , C ₂ H ₆ , EO, Ar, N ₂	MGA, LGA-4500	
		Process gases	CO, CO ₂ , C ₂ H ₄ , C ₂ H ₆ , O ₂ , trace H ₂ O	LGA-4500, TAI-2000/8800	
	PP	Process gases	CO, CO ₂ , C ₂ H ₄ , C ₂ H ₆ , H ₂ , C ₂ H ₂ , C ₂ H ₄ CL, Trace H ₂ O, O ₂	LGA-4500, TAI-2000/8800/3020T	
		Process gases	O ₂ , CO/CO ₂ , Trace H ₂ O in Benzene	LGA-4500	
	Chemical	PVC (VCM)	Feedstock C2H4	H ₂ O, O ₂ in C ₂ H ₄	LGA-4500
			Feedstock Cl2	O ₂ , trace H ₂ O in Cl ₂	LGA-4500
EDC gas			Cl ₂ , Trace H ₂ O in EDC	OMA-3010, LGA-4500	
Recycle gas			O ₂ , CO, CO ₂ , C ₂ H 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		
	Process gases	NH ₃ , Co ₂	LGA-4500		
	Process gases	O ₂	LGA-4100		
Hydrogen Peroxide Sulfuric Acid	Oxidation	SO ₂	OMA-3110		
	Feedstock gas	NOx, SO ₂ , O ₂ , CO, CO ₂	CEMS-2000		
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 ₂ S, CO ₂	LGA-4500PA (portable)	
		Acid gas removing	High H ₂ S	LGA-4500	
	Purification	Sulfur recovery exhaust gas	H ₂ S/SO ₂	OMA-3510	
		Exhaust gas treatment	SO ₂	OMA-3110	
	Transportation	Purified gas	Trace H ₂ S, H ₂ O	LGA-4500IC	
Compression	Pipelines and stations	Trace H ₂ S, H ₂ O	LGA-4500IC		
	CNG	Pipelines and stations	Trace H ₂ S, H ₂ O	LGA-4500IC	
		Pipelines and stations	Trace H ₂ S, H ₂ O	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 ₂ O	Dry HCL Exhaust	LGA-4100	
Thermal Power	Inlet of SCR Reactor	NOx, O ₂	Emission Monitoring	CEMS-2000B	
		NOx, O ₂ , Dust, TPF, Humidity	Flue gas Monitoring	CEMS-2000B	
	Outlet of SCR Reactor	NH ₃	NH ₃ Injection Control and NH ₃ Slip Detection	LGA-4100	
	Outlet of SCR Reactor	NOx, O ₂ , Velocity, Humidity	Desulfurization Efficiency Control	CEMS-2000B	
	Inlet of Desulfurization Reactor	SO ₂ , NOx, O ₂ , Dust, TPF, Humidity	Desulfurization Efficiency Control	CEMS-2000B	
	Outlet of Desulfurization Reactor	SO ₂ , NOx, O ₂ , Dust, TPF, Humidity	Desulfurization Efficiency Control	CEMS-2000B	
	Chimney	SO ₂ , NOx, O ₂ , Dust, TPF, Humidity	Emission Monitoring	CEMS-2000B	
	Cement	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	
		O ₂ , CO, CO ₂		LGA-4100	
	Outlet of Preheater Tower	O ₂ , CO	Process Optimizing	LGA-4100	
		O ₂ , CO		LGA-4100	
Cement	Outlet of Coal Mill	O ₂ , CO	Safety Control	LGA-4500	
		O ₂ , CO		LGA-4100	
Cement	Outlet of Bag Filter	O ₂ , CO	Safety Control	LGA-4100	
		O ₂ , CO		LGA-4500	