



LGA series

PROCESS LASER GAS ANALYSIS SYSTEM

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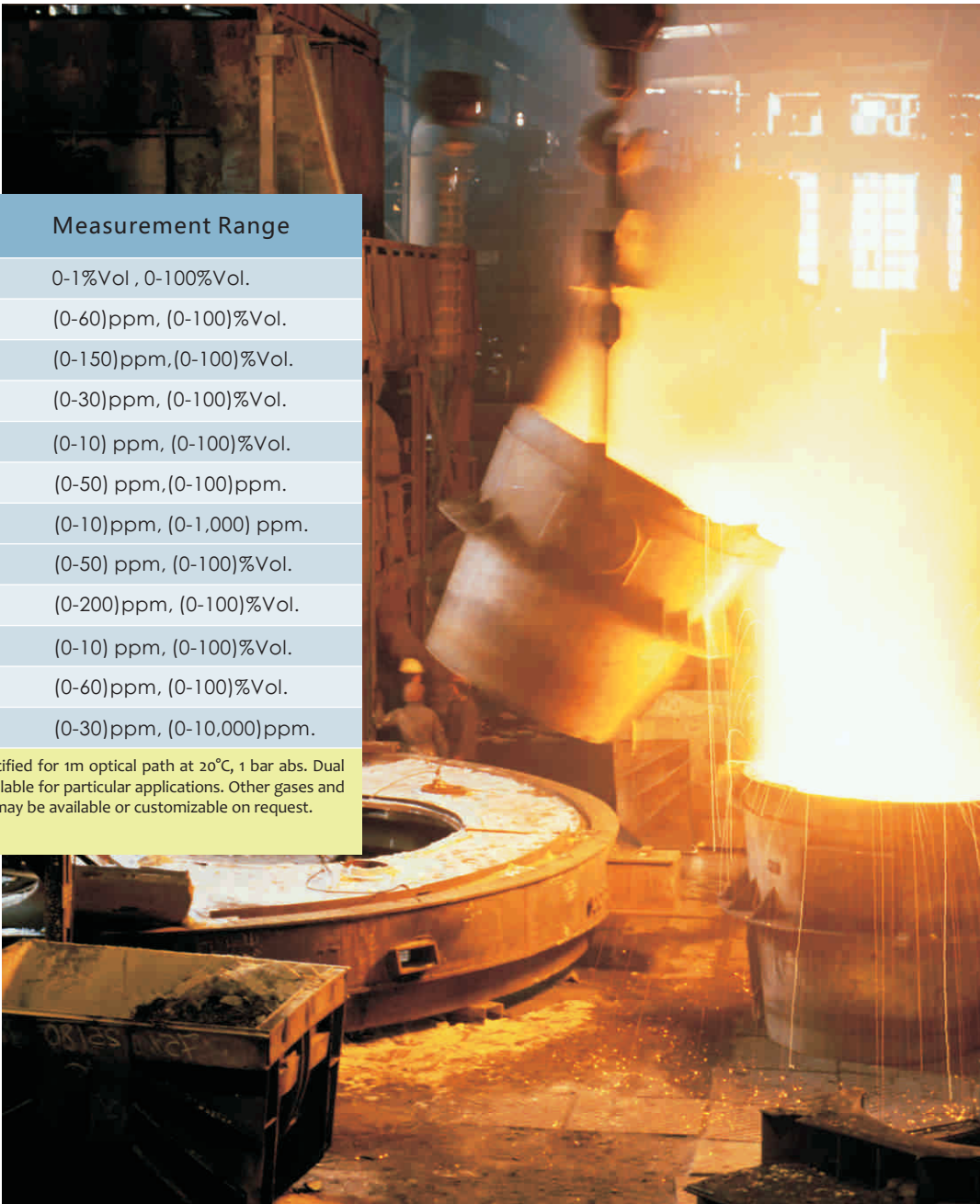


LGA series PROCESS LASER GAS ANALYSIS SYSTEM

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	0.01ppm	(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.

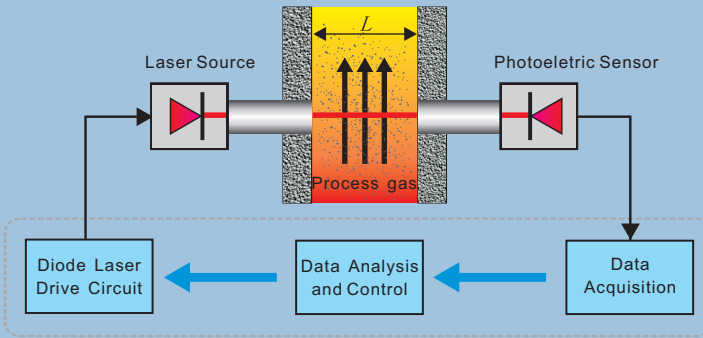
Notes: Listed are detection limits specified for 1m optical path at 20°C, 1 bar abs. Dual Gas CO+CO₂, HCL+H₂O are available for particular applications. Other gases and detailed measurement ranges may be available or customizable on request.

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

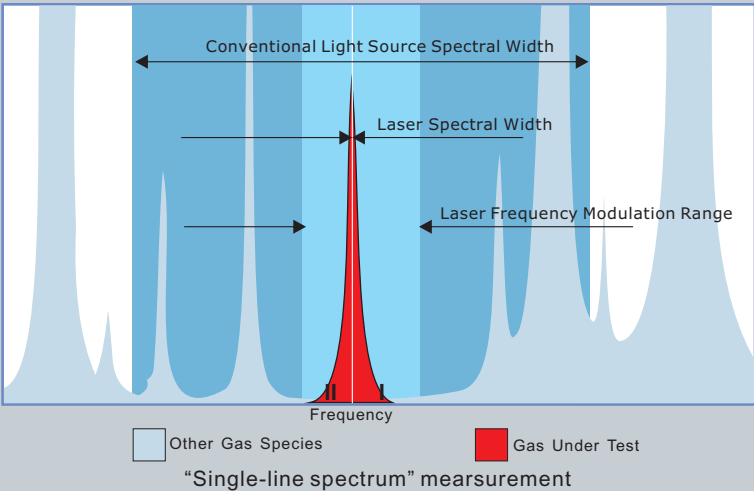
TECHNOLOGY COMPARISON

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

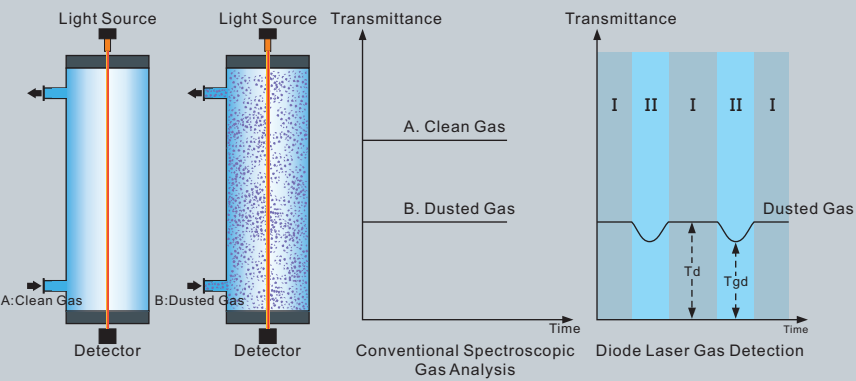
The laser spectrum features excellent monochromaticity with spectral width down to 0.001nm, which is much narrower than spectral width of other light sources. By utilizing the ‘Single-line’ spectroscopy, a well-targeted laser spectrum can be sorted out to cover only the measuring gas without overlapping 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 Td, whereas Area II is effected and gives Tgd.

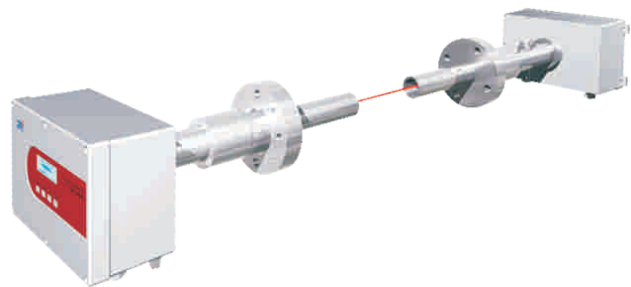
The transmittance of the gas under test is then calculated accurately by $T_g = T_{gd} / T_d$. The interference from dust and optical window contamination is, therefore, automatically screened out.



Automatic Temperature & Pressure Compensation

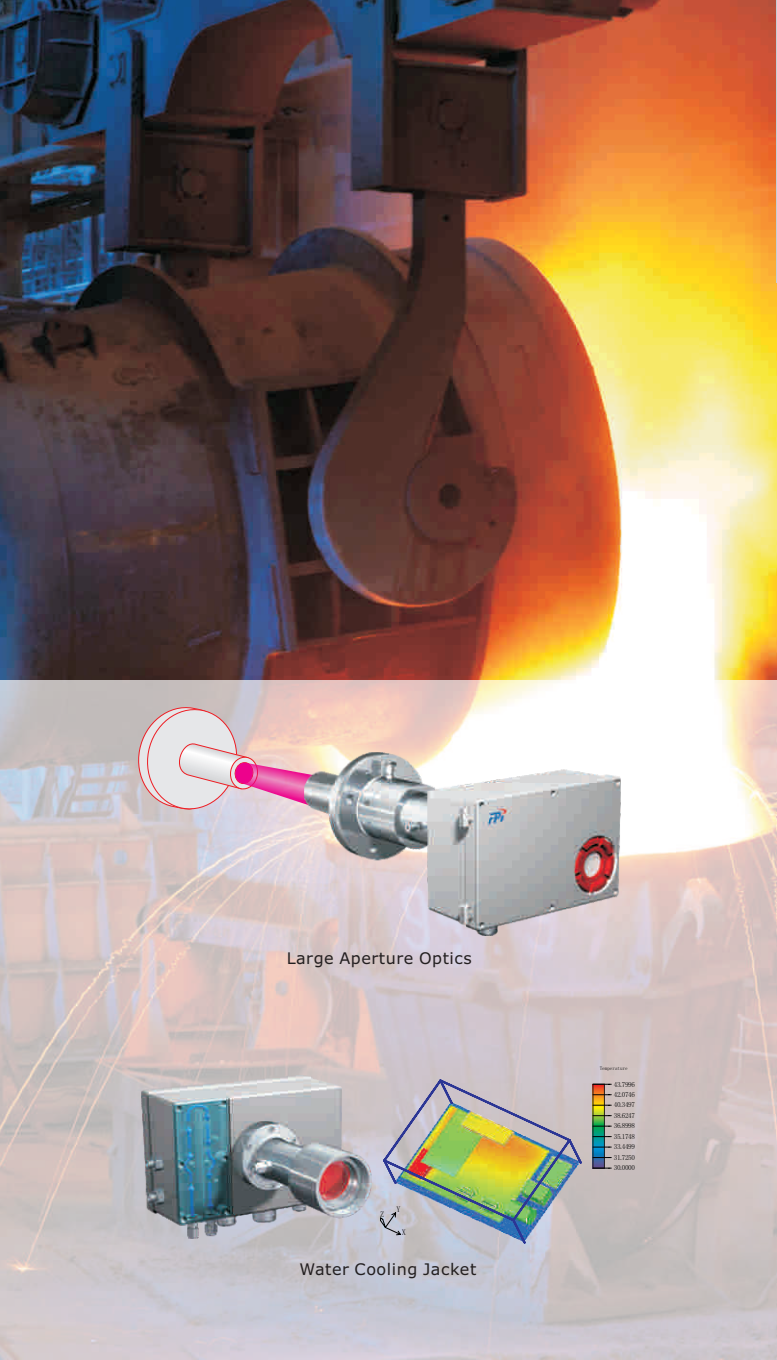
When gas temperature and pressure under measurement changes, the width and height of the absorption waveform change, which effects the accuracy of the measurement. By having 4-20mA process temperature and pressure input, the LGA system automatically compensates for them with a proprietary algorithm to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

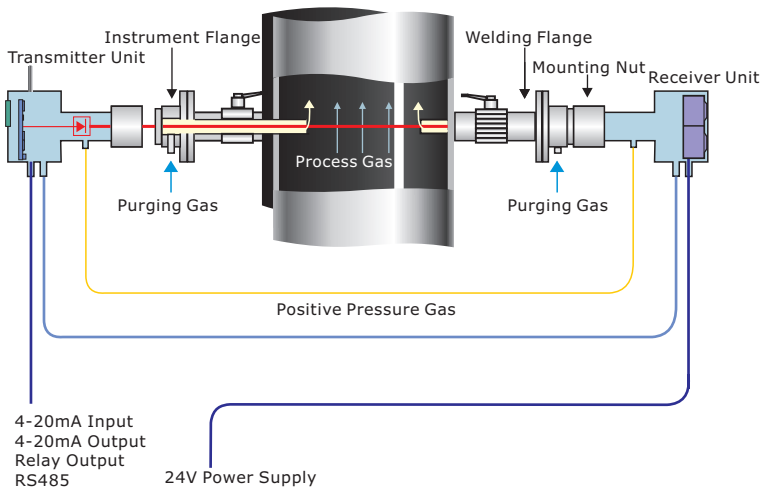
Operating conditions

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

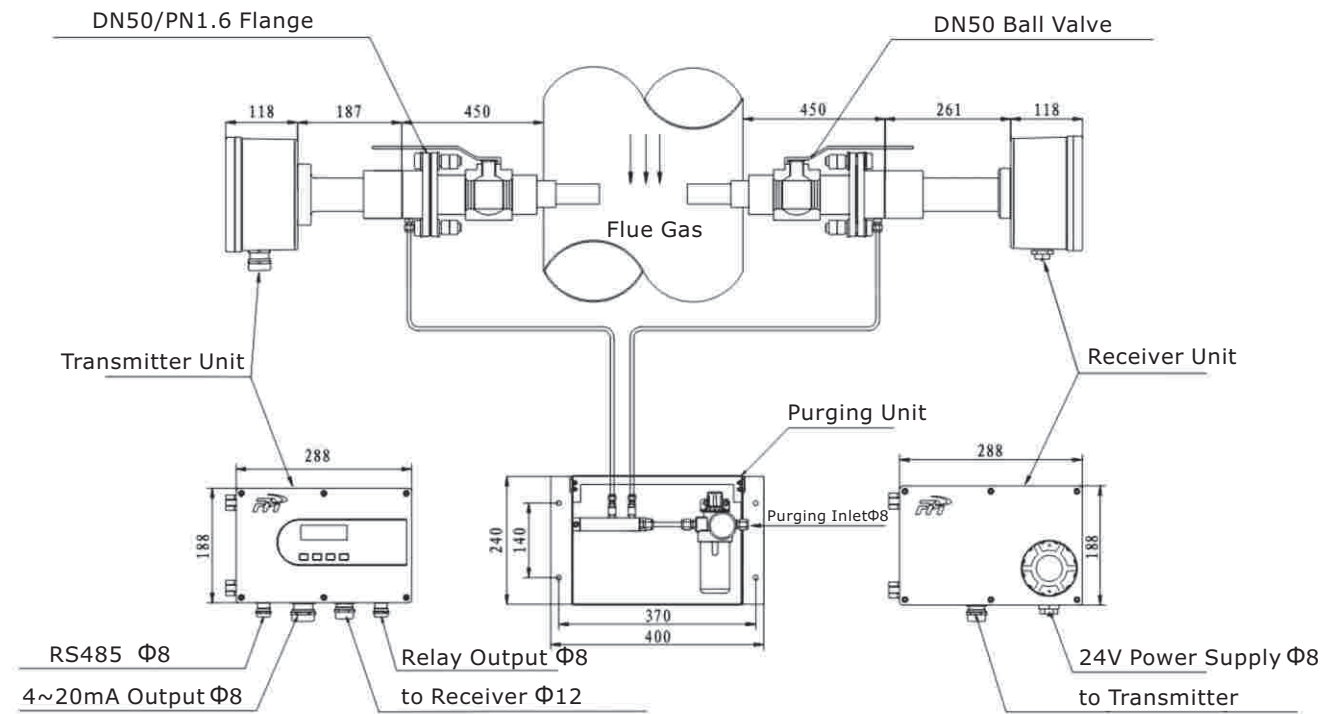
Laser class: class 1 conformant with IEC60825-1
CE certified: conformant with 2004/108/EC
IECEX certified: IECEX CQM 13.0047X
ATEX certified: ECM 15 ATEX-B 003 X

LGA Composition



LGA Dimension

Unit:mm



LGA-4500 Bypass



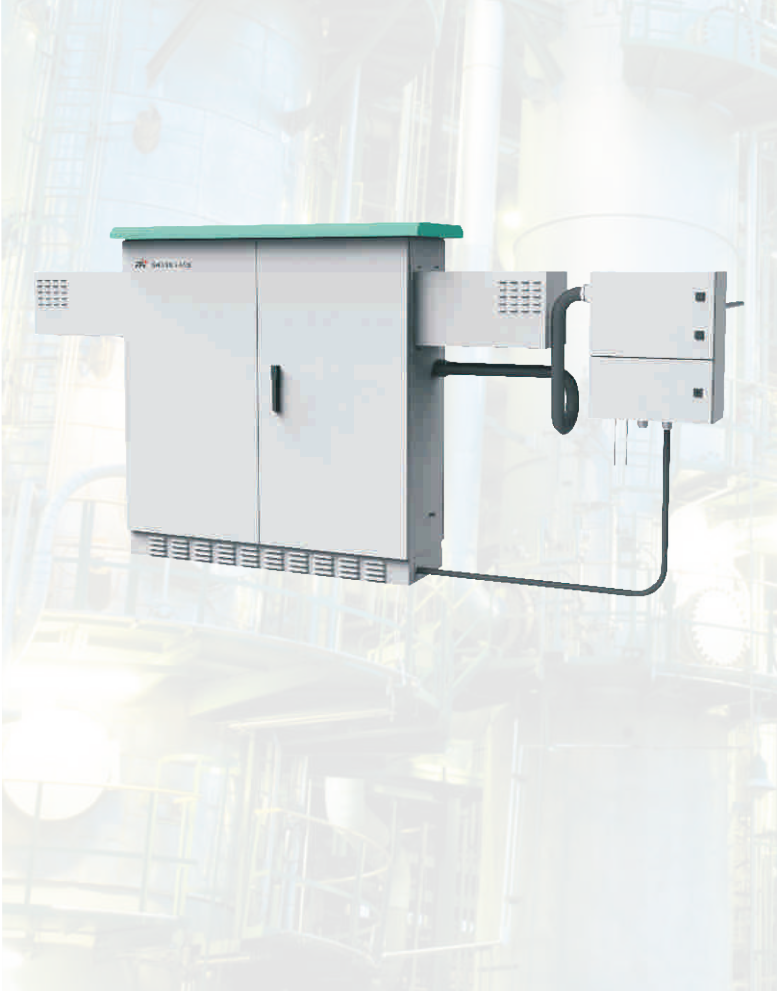
Corrosion resistant/high temperature proof gas cell

Features and Benefits

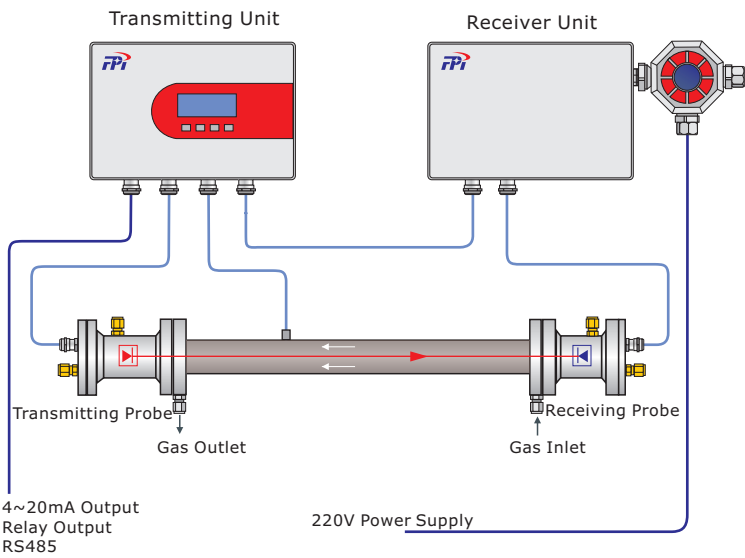
- Fast response
- High accuracy, ppm level resolution
- No cross interference
- Reliable in all harsh conditions: high temperature & pressure, dust density, moisture and corrosion
- Online calibration, no zero drift
- International ATEX certified

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

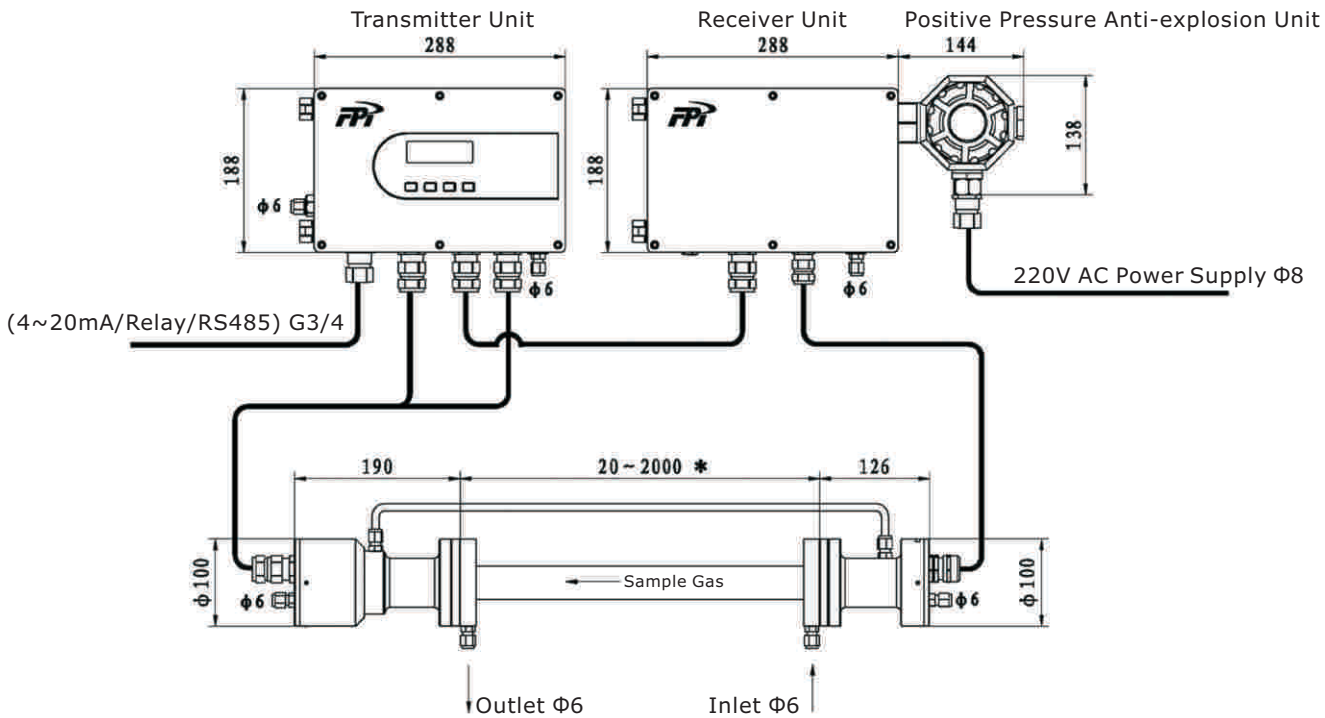


Technical Data

- 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: $T90 \leq 20s$.
- 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

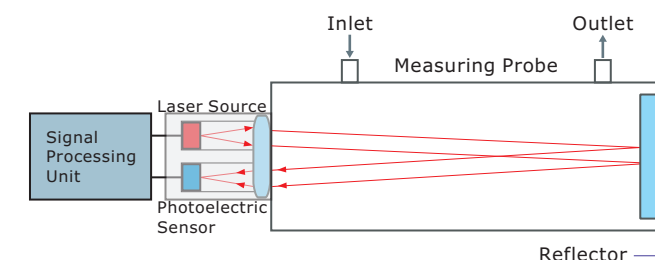
Application Areas

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

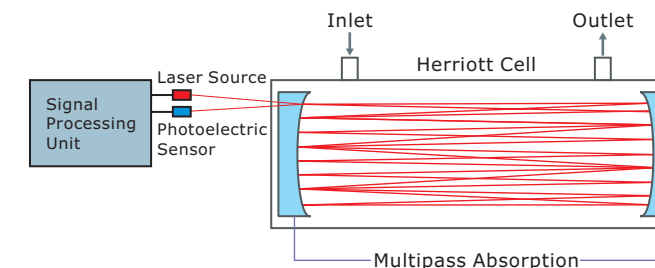
Gas	Detection Limit	Measurement Range
H ₂ O in natural gas	2ppm	0-100ppm
H ₂ S in natural gas	2ppm	0-50ppm, 0-200ppm

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

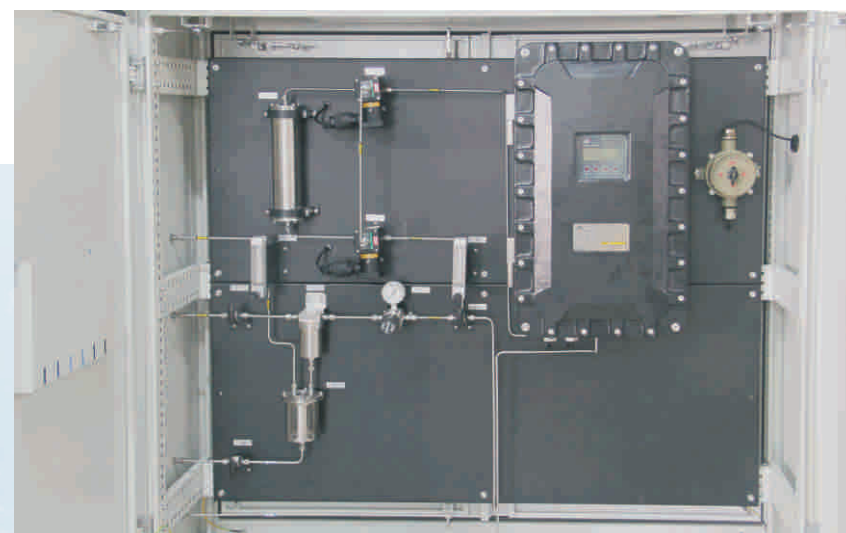
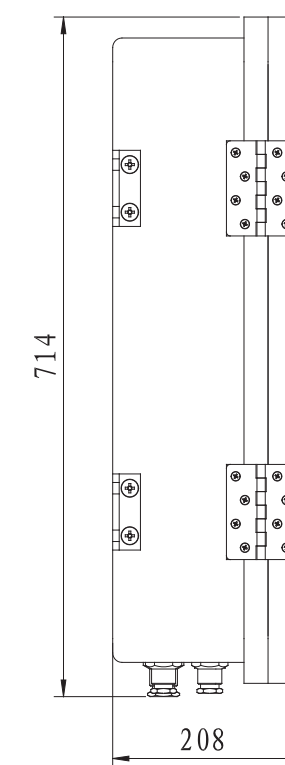
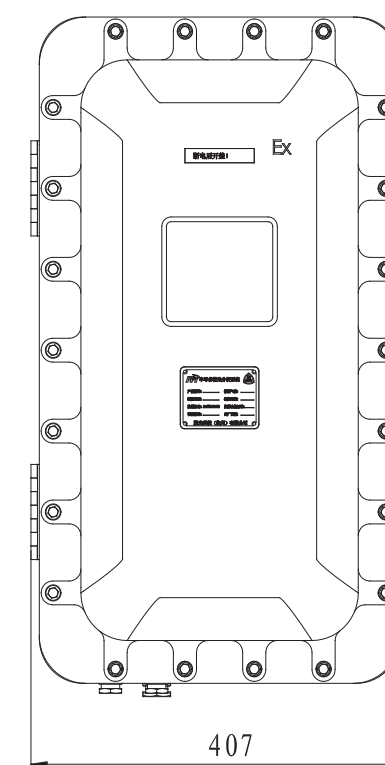
Power supply: 100-240V AC(H₂O), 200-240V AC(H₂S)/48-63Hz
 Power consumption: $\leq 12W$ (H₂O); $\leq 450W$ (H₂S)
 Operating temperature: -20°C to +50°C
 Protection class: Ip65

Approvals

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

LGA Dimension

Unit:mm



LGA-C300 Calorific Value



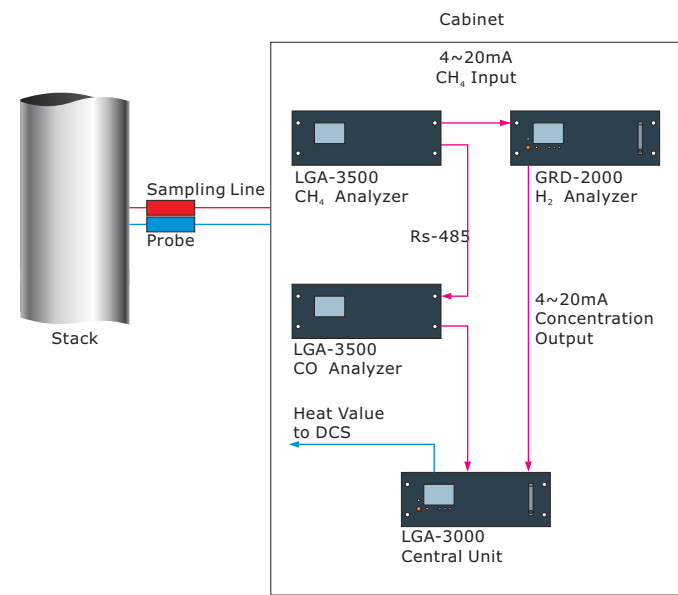
Features and Benefits

- 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: ≤ ± 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

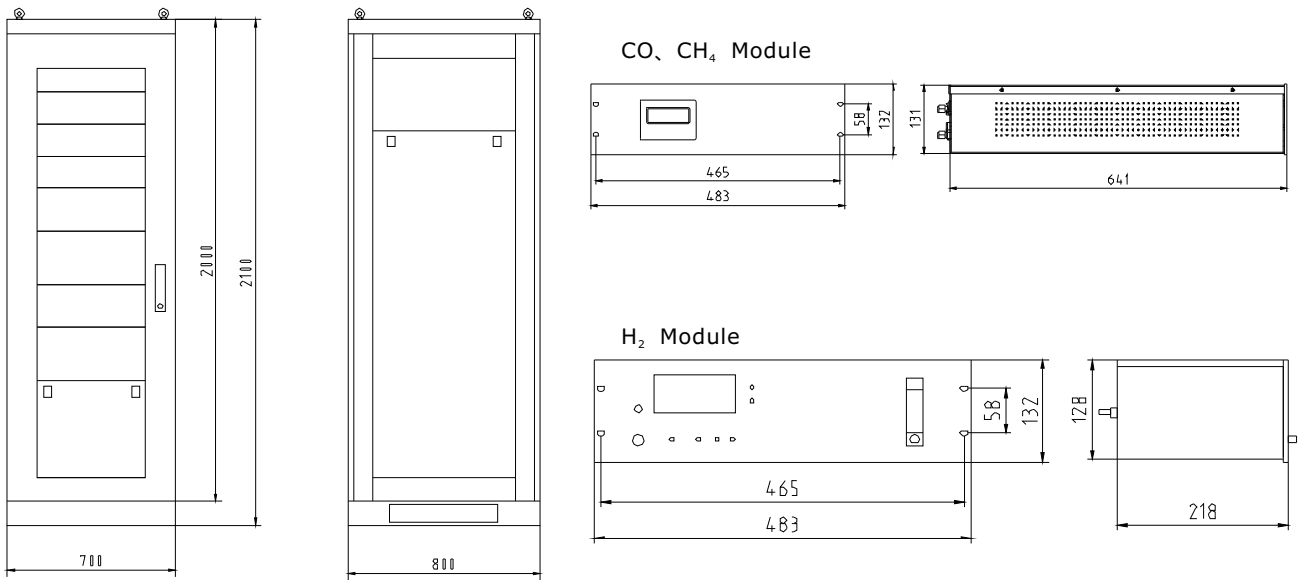
Approvals
Laser class: class 1 conformant with IEC60825-1

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.	≤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
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 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				
	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
	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	
Coking	Coke Oven Gas				
	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				
	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 ₂ S	0~100%	H2S:Air Proportioning, Reaction Optimizing	LGA-4100
	Outlet of Catalytic Reactor	H ₂ S/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 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
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
		CO	0~20%		LGA-C300
	Coke Oven Gas	CH ₄	0~60%		
		H ₂	0~60%		
	Mixed Gas	CO	0~40%		LGA-C300
		CH ₄	0~60%		
	Blast Furnace Gas	H ₂	0~40%		LGA-C300
		CO	0~50%		
		H ₂	0~10%		
O ₂		0~5%/0~1%			
Others	Industrial boilers/calciners	CO	0~5%/0~1% / (0~5000/0~2000)ppm	Process Optimizing, Safety Control	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
	EO/EG	Process gases	O ₂ , CO, CO ₂ , H ₂ O, CH ₃ COOH	LGA-4100/4500, SUPNIR
	PE	Process gases	O ₂ , CO ₂ , CH ₄ , C ₂ H ₄ , C ₂ H ₆ , EO, Ar, N ₂	MGA, LGA-4500
Chemical	PVC (VCM)	Process gases	CO, CO ₂ ,C ₂ H ₄ , C ₂ H ₆ , O ₂ , trace H ₂ O	LGA-4500, TAI-2000/8800
		Process gases	CO, CO ₂ , C ₂ H ₄ , C ₃ H ₈ , H ₂ , C ₄ H ₈ , C ₄ H ₁₀ 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
		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
	Methanol	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
	Ammonia Synthesis	HCL stripping	O ₂ in HCL	LGA-4500
		Process gases	O ₂ , CO, CO ₂ , NH ₃	LGA-4500/4100
		Process gases	NH ₃ , Co ₂	LGA-4500
DeNOx	SCR outlet		O ₂	LGA-4100
	Emission stack		SO ₂	OMA-3110
	Raw gas		NH ₃ slip	LGA-4500/4100
Natural Gas	Extraction	Acid gas removing Sulfur recovery exhaust gas Exhaust gas treatment	NOx, SO ₂ , O ₂ , CO, CO ₂	CEMS-2000
			High H ₂ S, CO ₂	LGA-4500PA (portable)
			High H ₂ S	LGA-4500
	Purification	Purified gas	H ₂ S/SO ₂	OMA-3510
			SO ₂	OMA-3110
			Trace H ₂ S, H ₂ O	LGA-4500IC
	Transportation	Pipelines and stations	Trace H ₂ S, H ₂ O	LGA-4500IC
	Compression	CNG	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	SO ₂ , NOx, O ₂ , CO, CO ₂ , Dust, TPF	Emission Monitoring	CEMS-2000B
		NOx, O ₂	Flue gas Monitoring	CEMS-2000B
		NOx, O ₂ , Dust, TPF, Humidity		CEMS-2000B
		NH ₃	NH ₃ Injection Control and NH ₃ Slip Detection	LGA-4100
		SO ₂ , O ₂ , Velocity, Humidity		CEMS-2000B
	Outlet of SCR Reactor	Desulfurization Reactor	Desulfurization Efficiency Control	CEMS-2000B
		Outlet of Desulfurization Reactor	Emission Monitoring	CEMS-2000B
		Chimney		CEMS-2000B
		Inlet of Coal Mill		LGA-4100
		Outlet of Coal Mill	Safety Control	LGA-4500
Cement	Outlet of Bag Filter	O ₂ , CO		LGA-4100
		O ₂ , CO		LGA-4500
		O ₂ , CO		LGA-4100
		O ₂ , CO		LGA-4100
	Coal Bunk	Kiln Outlet	Combustion Optimizing	LGA-4100
		Outlet of Preheater Tower		LGA-4100
		Inlet of Coal Mill	Safety Control	LGA-4100
		Outlet of Coal Mill		LGA-4500
	Outlet of Bag Filter	O ₂ , CO		LGA-4100
		Coal Bunk		LGA-4500