

# BONT<sup>®</sup>

Bont Technologies GmbH

## Laser Gas Analyzer LG2000



The Laser Technologies

## LG 2000 Series Laser Gas Analyzer

Utilizing proprietary technologies of Tunable Diode Laser Absorption Spectroscopy (TDLAS), the LG 2000 system to satisfy in-situ measurements with high accuracy, fast response, strong reliability and virtually maintenance free.

The LG 2000 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 LG 2000 system has been extensively used for combustion and safety control, process optimization, energy recovery, scientific research as well as environmental 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 <sub>2</sub>	0.01%Vol	0-1%Vol , 0-100%Vol
CO	0.6 ppm	(0-60) ppm , (0-100)%Vol
CO <sub>2</sub>	1.5 ppm	(0-150) ppm , (0-100)%Vol
H <sub>2</sub> O	0.3 ppm	(0-30) ppm , (0-100)%Vol
H <sub>2</sub> S	2 ppm	(0-200) ppm , (0-30)%Vol
HF	0.02 ppm	(0-2) ppm , (0-10,000) ppm Vol
HCl	0.01 ppm	(0-7) ppm , (0-8,000) ppm Vol
HCN	0.3 ppm	(0-30) ppm , (0-10,000) ppm Vol
NH <sub>3</sub>	0.4 ppm	(0-40) ppm , (0-100) %Vol
CH <sub>4</sub>	10 ppm	(0-200) ppm , (0-100) %Vol
C <sub>2</sub> H <sub>2</sub>	0.1 ppm	(0-10) ppm , (0-100) %Vol
C <sub>2</sub> H <sub>4</sub>	0.6 ppm	(0-60) ppm , (0-100) %Vol

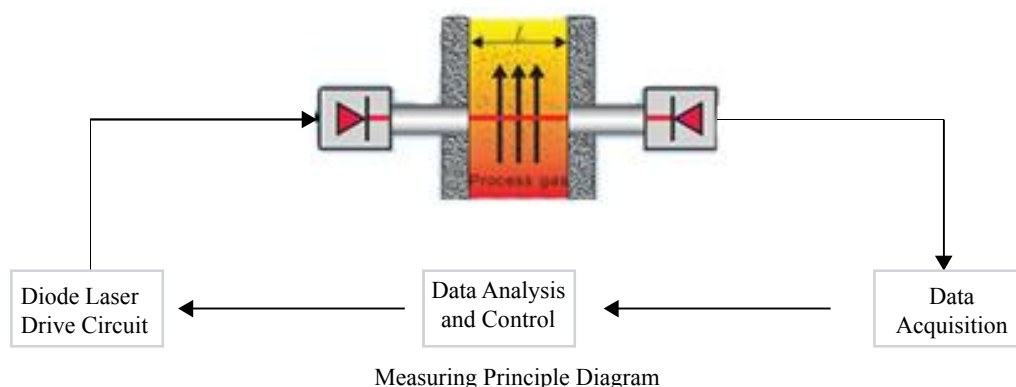
Notes : Listed are detection limits specified for 1m optical path at 20°C, 1 bar abs. Dual Gas CO+CO<sub>2</sub>, HCL+H<sub>2</sub>O are available for particular applications. Other gases and detailed measurement ranges may be available or customizable on request.

## Configuration

The transmitter portion of the LG 2000 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.



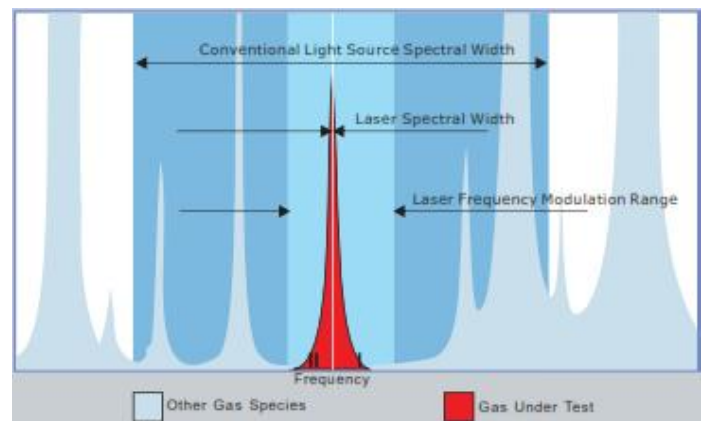
## Technology Comparison

Item	LG 2000 Laser System	Conventional Online Analysis
Adaptability	Applicable to high temperature, pressure, moisture, dust density and corrosion	Application 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 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 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 : <2 times/year Maintenance : <2 times/year	Calibration : 2-3 times / month Maintenance : frequent
Operation Costs	No spare parts, only cost of electricity	Lots of spare parts, around 20% of the equipment cost per year.

## Technical Principle

### • No Cross Interference

The laser spectrum features excellent monochromaticity with spectral width down to 0.001 nm, 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.

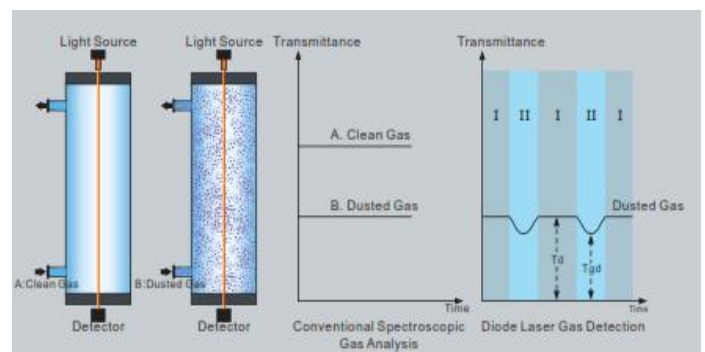


"Single-line spectrum" measurement

### • 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.



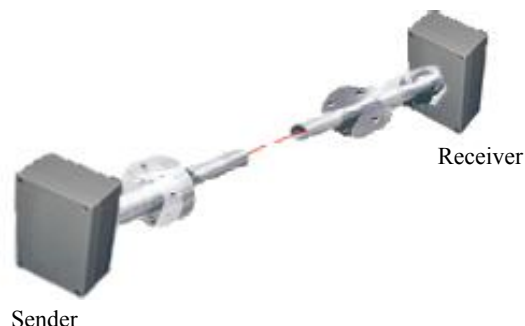
### • Automatic Temperature & Pressure Compensation

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 LG 2000 system automatically compensates for them with a proprietary algorithm to ensure measurement accuracy.

## LG 2100 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 NH<sub>3</sub> 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

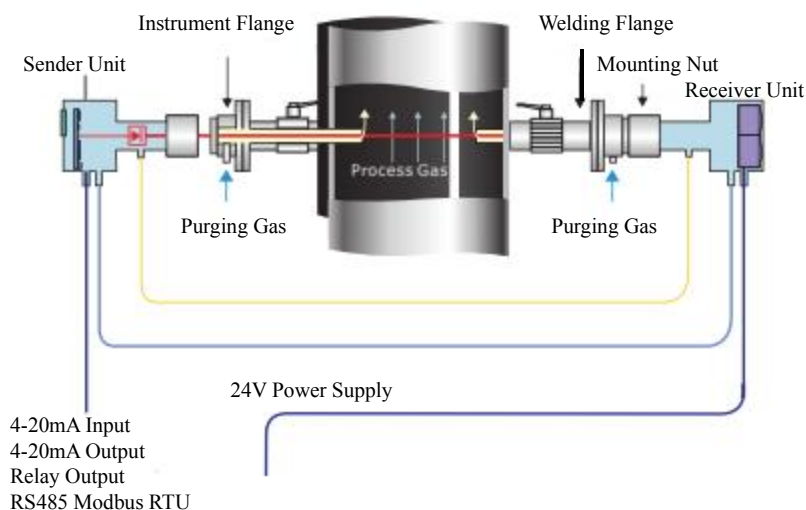
#### Metallurgy

- 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 NH<sub>3</sub> Injection
- Desulfurization Efficiency
- Coal Injection Safety Control
- HCL, HF Emission

### Composition



### Specification

- 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 : 0.5-30m
- 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 : 24VDC (21-36VDC), or 90-240VAC
- 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

## LG 2200 Sampling



Corrosion resistant / high temperature proof gas cell



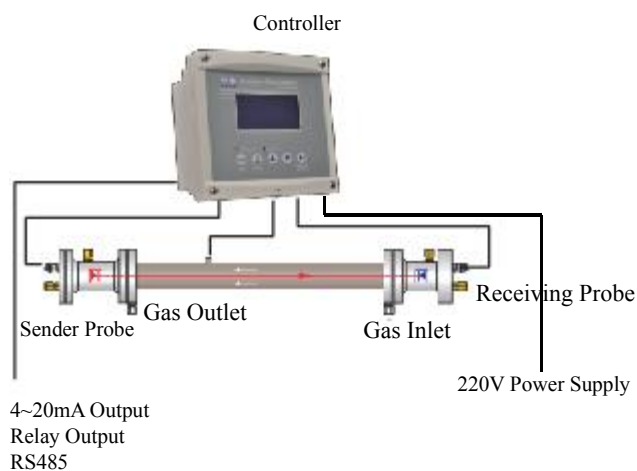
### Features and Benefits

- 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.

### Composition



### Specification

- Repeatability :  $\leq \pm 1\%F.S$
- Linearity :  $\leq \pm 1\%F.S$
- Span drift :  $\leq \pm 1\%F.S./6$  months
- Response time :  $\leq 1s^*$
- 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 :  $T_{90} \leq 20s$ .

### Input & Outputs

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

### Operating Conditions

- Power supply : 200-240VAC/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

- TUV EC Conformity : 16030374 001
- MCERT (Pending)

Dimension

