National special project for
significant scientific equipment development

Laser Raman Gas Analyzer

LRGA-6000 LRGA-3100 LRGA-3200EX

Fast measurement
No carrier gas

Fingerprint technology
Strong anti-interference
ability

Real-time measurement
of all components
Direct data visualization

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Laser Raman Gas Analyzers

Laser Raman gas analyzers are independently researched and developed by CUBIC INSTRUMENTS (a wholly-owned subsidiary of CUBIC Sensor and Instrument Co., Ltd), including in-situ Laser Raman gas analyzer and extractive Laser Raman gas analyzer. Based on the Laser Raman gas analyzer—a special product for the development of national significant scientific instruments and equipment, the optical path and structure were optimized to greatly reduce the size of the gas analyzer, so the new generation laser raman gas analyzer is much more compact and transportable. Based on the principle of laser Raman scattering, which enhances, collects, processes and identifies the characteristic Raman scattering spectra of the gas to be measured and quantifies the content, Laser Raman gas analyzer can provide online real time measurement for various gases simultaneously with the shortest response time in seconds.

Product Features

- Online real time measurement, one instrument can provide gas monitoring for whole industrial process gases
- Designed with intelligent software and full touch screen interface, data can be displayed intuitively, and PC keyboard can be connected externally
- Adopting Laser Raman gas characteristic fingerprint spectroscopy technology, strong anti-interference ability
- Wide detection range from 0-10% min and 0~100% max
- Capable of measuring multi-gases such as N_2, O_2, H_2, CH_4, C_2H_6, C_3H_8, H_2S etc
- Replacement to GS and MS

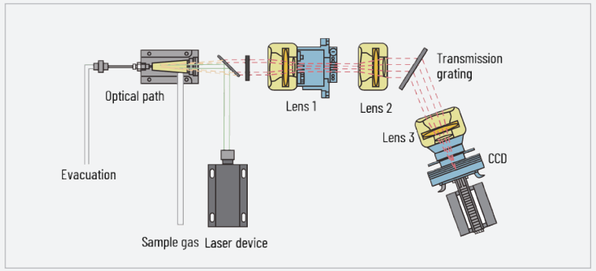
Main Parameters

	LRGA-3100/LRGA-6000	LRGA-3200EX
Sampling Method	Extraction type	In-situ type
Measurement Components	H_2, N_2, O_2, CO, CO_2, CH_4, C_2H_2, C_2H_4, C_2H_6, C_3H_6, C_3H_8, H_2S, Calorific Value etc.	H_2, N_2, O_2, CO, CO_2, H_2S, CH_4, C_2H_2, C_2H_4, C_3H_6, iC_4, nC_4, Calorific Value, etc.
Measurement Range	0~100% (can be customized)	0-100% (can be customized)
Accuracy	±1%F.S.	±1%F.S.
Repeatability	1%F.S.	1%F.S.
Working Temperature	LRGA-3100: 5~35°C LRGA-6000: 5~50°C	Probe/Sample Gas: -20~600°C Analyzer: -35~40°C
Power Supply	100~240VAC，50~60Hz (standard)	100~240VAC，50~60Hz (standard)
External Interface	RS-232/RS-485, TCP/IP, USB, 4~20mA	RS-232/RS-485, TCP/IP, USB, 4~20mA
Dimension	L590*W480*H177(mm)	L540*W300*H900 (mm)

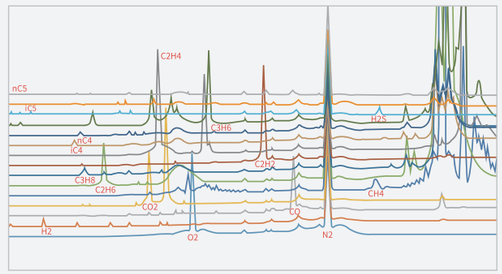
*For any special measurement range and accuracy request, please feel free to contact with manufacturer for further confirming.
*If you need further technical information, please email info@gasanalyzer.com.cnm.cn

Laser Raman Spectroscopy Technology

Laser Raman spectroscopy is a spectral gas analysis technology based on gas Raman scattering. It uses a high beam quality laser device to emit a specific wavelength laser light, which is focused in a gas chamber through an achromatic lens, then the laser and gas molecules collide with each other at the focal position to generate Raman scattering. The intensity of the Raman characteristic peak is proportional to the gas concentration value. By measuring and analyzing the position and intensity of the Raman characteristic peak with the spectrometer, the simultaneous measurement of multi-component gas can be realized. Since the excitation and collection of Raman scattering spectra are generated instantaneously, the time is very short and the signal collection can be performed in real time. Therefore, compared with chromatography and mass spectrometry, Raman spectrometers have a faster response speed.



Principle of Laser Raman Technology



Laser Raman Scattering Characteristic Peaks of Common Gases

Comparative Analysis of Common Technical Principles

Advantages of Laser Raman Spectroscopy

- *Adopting laser Raman gas characteristic fingerprint spectroscopy technology, capable of online measuring and monitoring concentration of gases like N_2, O_2, H_2, CO, H_2S etc in real time*
- *Strong anti-interference ability, can effectively avoid the influence of water*
- *Response time can be as fast as 30 seconds*
- *No carrier gas or chromatographic column needed, low maintenance cost*

Compared with Other Gas Analysis Technologies

Gas Chromatograph Analyzer

- *The detection time is as long as 15 minutes each measurement*
- *Not only consumables such as carrier gas and chromatographic column are required, but also professional training is required.*
- *Water vapor has a great influence on the measurement, and it is not suitable for the analysis of high boiling point, non-volatile and unstable substances*

Online Mass Spectrometer

- *Difficult to distinguish isomer gas, complicated operation.*
- *Large, heavy, slow and expensive.*
- *Easy to be polluted, high operation and maintenance costs, not suitable for on-line analysis of industrial sites.*

Fourier Transform Infrared Spectroscopy

- *Moving parts inside, poor stability.*
- *Only a single component can be analyzed at one time, narrow measurement range .*
- *Diatomic molecules such as H_2, O_2, N_2, etc. Cannot be measured.*

Matrix of Gas Compounds & Common Applications

Applications Measurement components	H_2	N_2	O_2	CO	CO_2	H_2S	NO	CH_4	C_2H_2	C_2H_4	C_2H_6	C_3H_6	C_3H_8	$i\text{-}C_4H_8$	$n\text{-}C_4H_8$	$i\text{-}C_4H_{10}$	$n\text{-}C_4H_{10}$	CH_3NO_2
Natural Gas	√	√		√	√	√		√			√		√					
Natural Gas Cracking	√		√	√	√			√	√	√								
Shale Gas		√			√			√			√		√					
Mud Logging		√	√	√	√				√	√	√	√	√					
Petrochemical			√					√				√	√					
Coal Chemical Industry	√	√	√	√	√		√	√										√
Coal to Glycol	√	√	√	√	√		√	√										√
Raw Coal Gas	√	√	√	√	√	√	√	√										√
Inlet of Pretreatment	√	√	√	√	√	√		√		√	√							
Conversion Gas Composition	√	√		√	√	√		√										
Ferrous Metallurgy			√	√		√												
Argon Blowing in Steel Ladle	√	√	√	√	√													
Mixed Gas of Blast Furnace, Coke Furnace and Converter Furnace	√	√	√	√	√	√		√	√	√								
Coke Oven Gas	√	√	√	√	√	√		√	√	√	√	√	√					
Heating Furnace Calorific Value Monitoring	√		√	√	√			√	√	√								
Coking	√	√	√	√	√	√		√	√	√								
Biomass Gasification	√	√	√	√	√			√	√	√	√	√	√					
Tire Cracking	√	√	√	√	√			√	√	√	√	√	√					
Pyrolysis/Gasification	√	√	√	√	√			√		√	√		√					
Rubber Gasifier	√	√	√	√	√	√		√	√	√	√	√	√	√	√	√	√	
Gasification Reactor	√	√	√	√	√	√		√	√	√	√	√	√					

*Please refer to data sheet for detail specification, if you need further technical information, please email info@gasanalyzer.com.cnm.cn

Advantages of Laser Raman Gas Analyzer LRGA-3100 in Different Applications

01 Natural Gas

- All the molecules in typical fuels have Raman activity, and Raman spectroscopy is more applicable as it can measure substances that cannot be measured by other technologies, such as H_2, N_2, etc.;
- In the field of natural gas measurement, Raman analysis technology has great sensitivity with fast detection speed and accurate measurement results.

02 Shale Gas

- Laser Raman spectroscopy is the best choice for shale gas analysis. When there are many components in the gas sample, the spectral peaks of long-chain hydrocarbon components often overlap with other components and cause intereference. However, shale gas usually does not contain butane and heavier components, so there is no need to consider butane during the choice of standard gas, and that makes the measurement and calibration simpler and more accurate;
- The laser Raman multi-point test can effectively reveal the uneven changes in the internal molecular structure of the dispersed organic matter particles in shale. Compared with the single-point test of other types of detectors, the reliability is much higher.

03 Mud Logging

- The main performance indicators of Laser Raman spectroscopy meet the requirements of gas analysis in mud logging, and its capablity of online analysis provides great convenience for the logging operation process;
- Raman scattering spectroscopic analysis technology has the characteristics of non-destructive, rapid analysis, high spatial resolution, and strong anti-interference ability; Compared with mud logging Gas Chromatography, it has obvious advantages in gas analysis extendibility, continuity, accuracy and sensitivity.

04 Petrochemical

- The peak characteristic of laser raman spectroscopy is quite high. The sharp peak characteristic and fluorescence interference elimination plays an important role in the detection of petroleum quality;
- High analysis accuracy, fast & simple & non-destructive operation, strong environmental adaptability, can meet the requirements of petrochemical field use;
- The internal standard method is used to calibrate the spectrum, which is easy to achieve standardization.

05 Coal Chemical

- Simple configuration, easy operation;
- No carrier gas and calibration gas are required, low operating cost;
- Simultaneous continuous real-time measurement in multi-channels, the measurement interval is zero, and the response time is only 30 seconds;
- Using the laser Raman gas characteristic fingerprint spectrum technology with strong anti-interference ability, no influence from water vapor.

06 Ferrous Metallurgy

- Raman spectroscopy does not require sample pretreatment, and can be collected in situ, which is beneficial to study the structural evolution of ferrite compounds under different conditions;
- There are many magnons in ferrite compounds, and magnons will also have an impact on the Raman spectrum, thereby increasing the difficulty of identifying the Raman spectrum. In this regard, the gas characteristic fingerprint spectroscopy technology has largely eliminated multiple interferences in the iron and steel metallurgy detection process.

07 Coking

- In the process of carbonization of organic matter, most of the gas molecules produced have complex group structure and spectral structure. Taking advantage of the strong characteristic peaks of laser Raman spectrum, the accuracy is greatly improved;
- In the process of coke oven gas analysis, the continuous real-time measurement of the Raman spectrometer can strictly control the leakage of toxic and harmful gases and provide guarantee for production safety.

08 Biomass Gasification

- Laser Raman spectroscopic analysis technology can be used to analsyis the composition of sygthesis gas from gasification process without interference from the sample itself, and with advantages of fast response and no-destructive measurement;
- The application of Laser Raman Gas Analysis technology can help the research in biomass energy field to develop in the direction of energy saving, environmental protection and low carbon, and provides the guarantee of molecular level analysis method for the study of the characteristic mechanism of biomass combustion, pyrolysis, gasification and liquefaction.

09 Tire Pyrolysis

- During the tire pyrolysis process, the Raman spectra of the process gases produced by different types of rubber pyrolysis have different characteristics. Laser Raman detection technology can be used to identify the impurity composition and content of the gas generated by the pyrolysis of various types of rubber;
- The use of Raman spectroscopy to analyze the gas in the rubber cracking process has the advantages of no pollution and no chemical treatment.

10 Rubber Gasifier

- During the detection process of the rubber gasification, the Raman analyzer can be installed in-situ on the process pipeline, without the need for a pretreatment system and an analysis room;
- Simultaneous measurement of multiple channels can replace up to 4 GC;
- Real-time measurement responds quickly, while other GC technologies require 5-15 minutes or even longer response times;
- No carrier gas, calibration gas, low operating cost, and no need for regular calibration.