LRGA 3100
LASER RAMAN ANALYSER

LRGA 3100 19''- 5U
Laser Raman online analyser

Typical applications

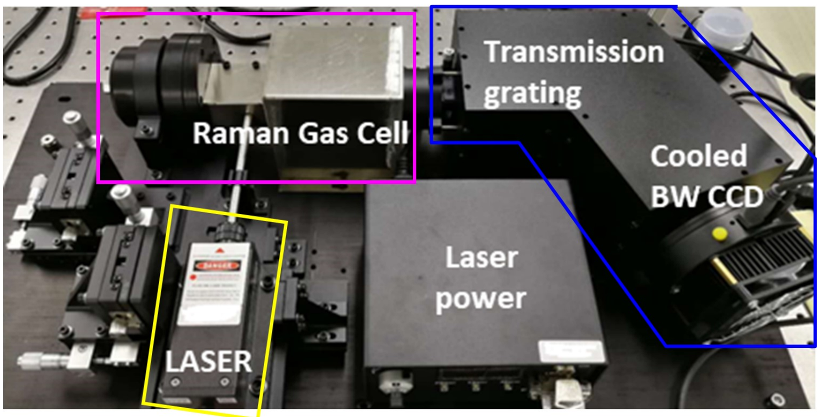
Biogas/Biomethane: N_2, O_2, CO_2, CH_4, H_2S, NH_3, COS, …

Natural gas: CO_2, CH_4, C_2H_6, C_3H_6, C_3H_8, C_4H_{10}, NH_3, H_2S, N_2, O_2

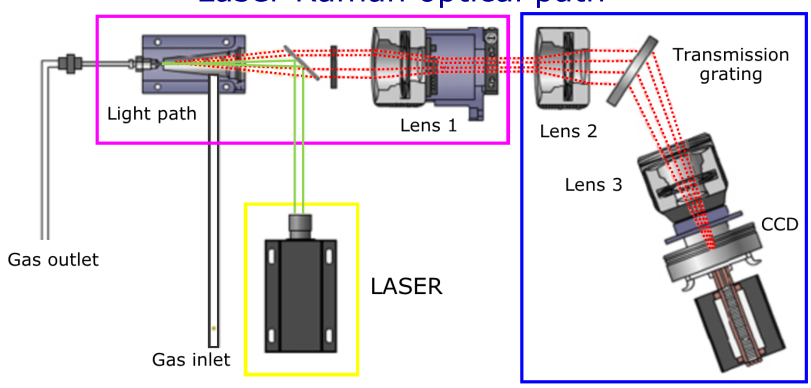
Syngas/coal gas: H_2, N_2, O_2, CO, CO_2, CH_4, C_2H_2, C_2H_4, C_2H_6, C_3H_6, C_3H_8, C_4H_{10}, NH_3, H_2S

Synthetic ammonia/Urea : H_2, N_2, O_2, CO, CO_2, CH_4, NH_3

Laser RAMAN analysis module



Laser Raman optical path



After the laser light has irradiated the sample, the scattered light is passed through a filter (to get rid of all the light from the excitation laser). Then it is directed onto a grating (transmission grating), which distributes the inelastic parts like a prism and according to wavelength. At the end, these rays are directed to a CCD sensor which then produces a spectrum depending on the intensity.

Non contractual pictures and specifications - Subject to change without prior notification - Doc. version - EN23v1

Pollutek Gas Analysis

Description

Laser Raman Spectrometer LRGA-3100 is based on the principle of 540-680 nm green laser Raman scattering, which enhances, collects, processes and identifies the characteristic Raman scattering spectra of the gas to be measured and quantifies the content.

Online real time measurement of various gases on full range simultaneously.

Analysis capabilities

Each project is specific and requires a preliminary study to determine gaseous components and their respective ranges to measure.

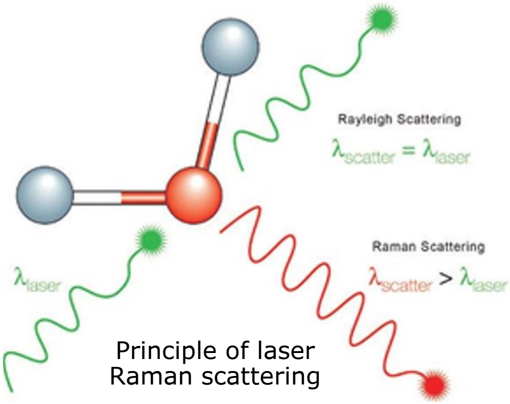
The analyser can measure simultaneously and in real time many different gaseous macro-components like H_2, N_2, O_2, CO, CO_2, CH_4, C_2H_2, C_2H_4, C_2H_6, C_3H_6, C_3H_8, C_4H_{10}, NH_3, H_2S.

Available ranges: from 0.01~10% to 0.01~100%

Pollutek gas analysis supplies single analyser or fully integrated analysis solutions. Consult us for your projects.

LRGA-3100 Laser Raman Analysis system.
Explosion proof version also available.

Laser RAMAN technology



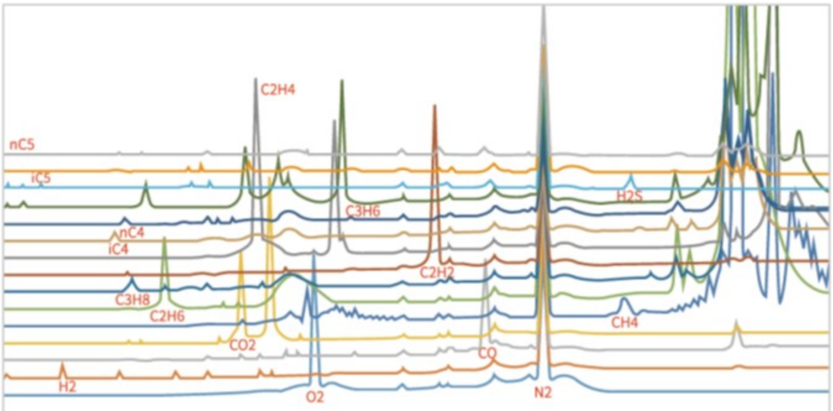
Principle of laser Raman scattering

The Raman Effect is the shift in energy compared to a monochromatic radiation source, such as a laser, caused by inelastic scattering.

When the monochromatic source interacts with matter, a scattering of photons will occur. Most of the scattered photons will have the same energy as the source (elastic scattering or Raleigh scattering).

An incredibly small number of photons emitted (1 in 10 million) will have a different vibrational energy (inelastic scattering or Raman shift) if energy has been gained or lost by the molecules.

Being that inelastic scattering is particularly weak, it is necessary to use an extremely powerful source to increase the number of photons that cause it. The Raman Spectrometer provides a very strong source that enables its detector to see and record this small portion of the scattered radiation.



Laser Raman scattering characteristic peaks of syngas compounds

Raman spectroscopy is both qualitative and quantitative.

Each molecule has its own distinctive and unique vibrational energy which is determined by its chemical composition, molecular mass, and bonding factors.

When the energy of the incident light is constant, the intensity of the Raman peak produced by the gas is proportional to the concentration of the gas.

A Raman spectrometer can record this energy, known as “fingerprint”, and compare it against a database of known samples.

Main features and advantages

- High precision with Laser Raman gas characteristics fingerprint technology.
- One instrument to measure selectively and simultaneously all main components in biogas, biomethane, natural gas, syngas, coal, gas, etc.
- Online and in real time measurement of multiple gaseous components.
- Advantageous alternative to gas chromatography and mass spectrometry
- Wide detection range: macro-components from 0.01~10% to 0.01~100%
- Quick response time, direct display of the full gas composition.
- Automatic temperature and pressure correction
- High accuracy, repeatability and stability of the measurements; insignificant drift in the time.
- Intelligent software design, full touch screen interface, intuitive display of data
- Low operation & maintenance costs, no gases and air required for operation, no consumables.
- Extractive dry cold analysis method

Laser Raman vs. other technologies

Laser Raman technology can advantageously replace gas chromatography (GC) and Mass spectrometry (MS) techniques to measure almost all gas components including diatomic molecules like N_2, O_2, H_2 in the field of coal gas, syngas, biogas, biomethane, natural gas and all related processes.

Our LRGA-3100 features online, real-time, accurate, stable, selective, and simultaneous measurement of multiple macro (%) components. No moving parts, no consumables like carrier gas and chromatographic column required to operate. The 19’’-5U design, its simple operation and low maintenance costs make the LRGA-3100 the ideal analyser for easy integration in industrial gas analysis cabinet for online and real time process monitoring or for use in research laboratory as desk type analyser.

Fourier transform infrared spectroscopy (FTIR)

FTIR spectrometers rely on the principle that many gases absorb IR radiation at species-specific frequencies. FTIR spectroscopy is a disperse method, which means that measurements are performed over a broad spectrum instead of a narrow band. At the difference of the NDIR analyser, the FTIR spectrometer offers multi-gas analysis capability but in small ranges. It also has moving parts, poor stability and is highly interfered by water. Finally, it cannot measure diatomic molecules like N_2, O_2, H_2.

Gas Chromatography (GC)

GC analyser needs chromatographic columns, carrier gas and professional trained people to operate; it has a long response time (5 to 30 min), water vapour influences largely the measurement, and it is not suitable for the analysis of high boiling point, non-volatile and unstable substances.

Mass spectrometry (MS)

A mass spectrometer is very expensive and bulky; its operation is complicated, the response time is slow, it can be easily polluted and maintenance costs are high. It is therefore rarely used as an industrial field analyser. The MS technology also shows problems of indistinguishability and complicated operation for isomer gases.

Technical specifications

Measurements	
Technology	Laser Raman gas characteristic fingerprint technology (light scattering)
Spectral Range	540~680 nm Raman Shift
Spectral Resolution	0.2 nm
Method	Extractive dry cold
Current available gases	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, C_4H_{10}, NH_3, H_2S
Ranges	From 0-10% to 0-100% (customizable, please consult us)
Display resolution	0.01%vol
Performances	
Accuracy / Linearity	≤±2% FS
Repeatability	≤±1%
Lowest detection limit (LDL)	≤±0.1%
Analyser response time	1~2 seconds to work out the characteristic spectra of all measured gases, to compare them with the predefined spectra database and to output real time gas concentration values or spectra views.
Zero/Span drift	Negligible drift in the time
Calibration requirement	Recommended each 6 months
Warm-up	800s + 30 minutes stabilization time for full performances
Cross-sensitivities	Negligible due to the used gas characteristic fingerprint technology
Sample gas conditions	
Flow rate	0.7 to 1.2 LPM ; nominal 1 LPM (needs external gas pump)
Inlet Pressure	20~30 mbar
Outlet pressure	Atmospheric pressure
Temperature	5 to +45℃
Gas quality	Clean and dry gas (tars, dust and moisture must be removed before analysis)
Operating conditions	
Ambient temperature	+10 ~ 35℃
Ambient pressure	86~108 KPa
Ambient humidity	< 95% RH, non-condensing
HMI & Communication	
Display	Touch screen colour display
	Display of measurement data as real time %values or spectra
Recording capacity	Continuous data recording during 10 minutes (40 GB capacity)
Analyser software	Intelligent software design with intuitive interface
Communication port	USB
Data exportation interval	Data exportation to external PC freely configurable from 1 to 600 sec
Data exportation model	Measurement data as concentrations (%vol) or as spectra data which are archived in an Excel file. It is then possible to reconstruct an image of a specific spectrum from the spectra data recorded in the Excel file.
Electrical	
Power supply	100~240VAC, 50/60Hz, 30W
EMC immunity	Compliance to EN/IEC 61326-1:2013
Mechanical	
Enclosure type	Standard rack 19”- 5U, IP20
	Optional transportable version possible on request

Dystrybucja i serwis: ATUT Sp. z o.o.
ul. B. Prusa 8, 20-064 LUBLIN
tel./fax: 81 740 33 45
e-mail:info@atut.lublin.pl; www.atut.lublin.pl