# Raman Rxn5 analyzer

## Laser-based composition analysis

### Benefits at a glance

- Replaces legacy techniques such as GC, MS, lead acetate tape, and photometers with state-of-the-art, laser-based gas-phased Raman technology
- Utilizes process-hardened fiber optic probes that can be mounted at the sampling point to enable pipe-centric analysis
- Requires minimal sample conditioning due to probes operating at line pressure (up to 1000 psig) and temperature up to 150 °C
- Eliminates stream-switching and dramatically reduces sample update times due to simultaneous, multi-stream analysis of up to four streams
- Allows for the use of simple univariate methods for composition measurement with baseline-separated peaks, similar to chromatogram analysis
- Provides for lower cost of ownership
  - No routine calibration
  - No columns, valves, or ovens
  - No carrier gases
  - No instrument air

### Introduction

The Raman Rxn5 analyzer is a turn-key, laser-based analyzer for applications in the petrochemical and gas treatment markets. In many of these applications, the Raman Rxn5 analyzer produces spectra that resemble and can be analyzed with the simplicity of chromatograms. However, unlike gas chromatographs (GCs), the Raman Rxn5 analyzer does not require valves, ovens, or columns, and does not use carrier gas. Overall reliability and low cost of ownership are unparalleled in this category of advanced process analyzers.

Fiber-optic probes are used to interface the Raman Rxn5 analyzer to the process sample in the preferred pipe-centric installation. The ease of installation and interfacing provides significant cost savings versus traditional GC or mass spectrometer (MS) systems and their associated sampling systems.

The Raman Rxn5 analyzer design incorporates customer requirements for serviceability and utilities, meeting the hazardous and harsh ambient requirements of typical petrochemical, chemical, and gas treatment plants.

### Multi-component, multi-stream capability

The Raman Rxn5 analyzer provides composition analysis of gas mixtures containing many of the following gases at concentrations between 0.1 and 100% (by volume): $H_2$, $N_2$, $O_2$, CO, $CO_2$, $H_2S$, $CH_4$, $C_2H_4$, $C_2H_6$, $Cl_2$, $F_2$, HF, $BF_3$, $SO_2$, $CO_2$.*

Featuring four independent probes operating simultaneously, the Raman Rxn5 analyzer eliminates the need for mechanical stream switching and allows for the application of four independent methods in one unit.

### Analyzer reliability

The Raman Rxn5 analyzer incorporates numerous features that result in greatly improved reliability: no critical moving parts, no routine maintenance or calibration, no consumables, reduced technician skill level to operate and maintain, minimal spare parts, and the ability to operate in harsh environments without the need of shelter installation.

### Integrated process and sampling interface

The Raman Rxn5 analyzer is compatible with pipe-centric process and sampling interfaces. The ability to integrate an analytical sensor within a sampling system to measure samples ‘at the sample tap’ is a major advancement in improving overall sampling system reliability.

### Proven technology

Raman spectroscopy has been a well-known and established measurement technology since its discovery in 1928. While on-line gas-phase analysis is a relatively recent application for Raman spectroscopy, Endress+Hauser first successfully installed a Raman Rxn5 analyzer for syngas analysis at a world-scale coal gasification facility in 2008, and has continued this success in numerous gas manufacturing facilities.

* See current application notes for stream types and stream compositions that can be measured.

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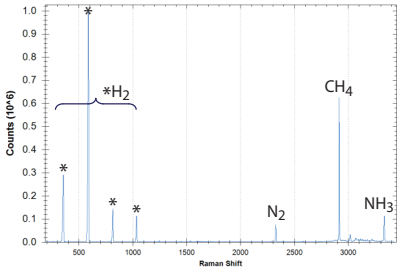
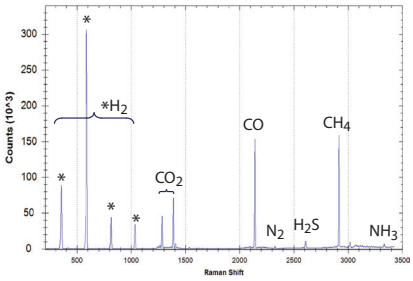
## Application examples

Typical spectra from selected petrochemical and refining processes




$NH_3$ synthesis loop: recycle stream




Gasifier raw syngas

## Process measurement points:

- Reformers (SMR, POX, ATR)
- Gasifiers (coal, petcoke, waste, biomass)
- Shift converters
- Hydrotreaters
- Hydrocrackers
- $CO_2$ removal
- Finished product synthesis loops

## Typical industries:

- Hydrogen production/purity
- HyCO production
- Methanol production
- Ammonia production
- Hydrogen recycle
- Gas turbine fuel feed
- Synthetic natural gas/IGCC power plants
- LNG rundown to storage tanks
- LNG mixed refrigerant optimization

## Technical specifications

| | |
|---|---|
| Principle of measurement | Laser-based gas-phase Raman spectroscopy |
| Sample interface | **Process interface:** Rxn-30 probe (gas), Rxn-40 probe (liquid), Rxn-41 probe (cryogenic liquid)<br>**Sample flow rate:** compatible with stop/flow measurement |
| Electrical data | **Input voltage:** 100 – 240VAC, 50-60 Hz - standard<br>**Max power:** <300 Watts max (startup), 200 Watts typical<br>**Communications:** serial: RS485, Modbus TCP/IP<br>**User interface:** touch-screen color LCD display |
| Physical | **Enclosure type:** painted steel (IP56)<br>**Dimensions:** 18.0 x 32.85 x 10.0 in (45.72 x 83.44 x 25.4 cm) WxHxD<br>**Weight:** ~ 135 lbs (61 Kg)<br>**Number of probes:** up to four (a dedicated laser per probe allows for simultaneous operation)<br>**Environmental temperature range:** -20 °C to 50 °C (solid state cooling – no vortex or other external cooling required) |
| Area classification & ratings | **CSA:** Class I Div 2 Groups B C D T4<br>**IECEx/ATEX:** II 3 (2) (1) G Ex ec ic [ia Ga] [op sh Gb] pzc IIC T4 Gc Ta -20 °C to +50 °C |



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