

# Kaiser Raman Analyzer Application Guide

The ideal solution for composition analysis of gas streams and LNG in the Oil & Gas and Chemical industries



# Application Guide

Listed below are applications in the Fertilizer, Bulk Gas, Refining, Synthetic Natural Gas (SNG), Methanol and Oil & Gas industries where Kaiser Raman analyzers are used to measure gas and liquid composition. Measured gases include CO (carbon monoxide), CO<sub>2</sub> (carbon dioxide), H<sub>2</sub> (hydrogen), N<sub>2</sub> (nitrogen), O<sub>2</sub> (oxygen), H<sub>2</sub>S (hydrogen sulfide), NH<sub>3</sub> (ammonia), CH<sub>3</sub>OH (methanol), CH<sub>4</sub> (methane), C<sub>2</sub>H<sub>6</sub> (ethane), C<sub>3</sub>H<sub>8</sub> (propane), and more. Measured liquids are currently focused on the Oil & Gas industry and include liquefied natural gas and mixed refrigerant composition. For more information on a specific application, please refer to the Application Notes found at [Optograf.com](http://Optograf.com).

The Rxn4™ Analyzer, Optograf™ Analyzer, AirHead™ probe, and Pilot™ probe were developed and are manufactured by Kaiser Optical Systems, Inc., an Endress+Hauser company, and are powered by Kaiser patented holographic technology. The Optograf Analyzer has been specifically designed with the high sensitivity required for our gas-phase applications and the field instrument performance required for liquid process measurements. The Rxn4 Analyzer provides even higher accuracy required for LNG custody transfer applications.

## Gas-Phase Applications

Industry	Process Plant	Measurement Parameter	Stream Sample Overview	Sample Interface	Application Note
Fertilizer	Ammonia		Ammonia Production Analytics Overview		AM0
		Carbon Number	Natural Gas Feed to Primary Reformer	OptoAST	AM1
		BTU	Fuel Gas to Reformer Furnaces	OptoAST	AM2
		Composition/CH <sub>4</sub>	Raw Syngas - Primary Reformer Outlet	OptoDRS	AM3
		Composition/CO	Raw Syngas - Secondary Reformer Outlet	OptoDRS	AM4
		Composition/CO	High Temperature Shift Converter Outlet	OptoDRS	AM5
		Composition/CO <sub>2</sub>	Low Temperature Shift Converter Outlet	OptoDRS	AM6
		Composition/CO <sub>2</sub>	CO <sub>2</sub> Absorber Outlet - Methanator Inlet	OptoAST	AM7
		Composition/H <sub>2</sub> /N <sub>2</sub>	Methanator Outlet - Purified Syngas	OptoAST	AM8
		H <sub>2</sub> /N <sub>2</sub> Ratio	Ammonia Converter Feed Stream	OptoAST	AM9
		Composition/Impurities	Ammonia Converter Exit Stream	OptoAST	AM10
	CH <sub>4</sub> Impurities	Synthesis Loop Purge Gas	OptoAST	AM11	
Bulk Gas Suppliers	HyCO Plants		HyCO Production Analytics Overview		HY0
		Carbon Number	Natural Gas Feed to Primary Reformer	OptoAST	HY1
		BTU	Fuel Gas to Reformer Furnaces	OptoAST	HY2
		Composition/CH <sub>4</sub>	Raw Syngas - Primary Reformer Outlet	OptoDRS	HY3
		Composition/CO	Raw Syngas - Secondary Reformer Outlet	OptoDRS	HY4
		Composition/CO	High Temperature Shift Converter Outlet	OptoDRS	HY5
		Composition/CO <sub>2</sub>	Low Temperature Shift Converter Outlet	OptoDRS	HY6
		Composition/CO <sub>2</sub>	CO <sub>2</sub> Absorber Outlet - Feed to PSA	OptoAST	HY7
		Composition/H <sub>2</sub> /N <sub>2</sub>	PSA Unit H <sub>2</sub> Stream	OptoAST	HY8
	CH <sub>4</sub> Leakage	CO <sub>2</sub> Recovery Stream	OptoAST	HY9	
Refining	H <sub>2</sub> Production		Captive Hydrogen Production Analytics Overview		HH0
		Carbon Number	Natural Gas Feed to Primary Reformer	OptoAST	HH1
		BTU	Fuel Gas to Reformer Furnaces	OptoAST	HH2
		Composition/CH <sub>4</sub>	Raw Syngas - Primary Reformer Outlet	OptoDRS	HH3
		Composition/CO	Raw Syngas - Secondary Reformer Outlet	OptoDRS	HH4
		Composition/CO	High Temperature Shift Converter Outlet	OptoDRS	HH5
		Composition/CO <sub>2</sub>	Low Temperature Shift Converter Outlet	OptoDRS	HH6
		Composition/CO <sub>2</sub>	CO <sub>2</sub> Absorber Outlet - Feed to PSA	OptoAST	HH7
		Composition/H <sub>2</sub> /N <sub>2</sub>	PSA Unit H <sub>2</sub> Stream	OptoAST	HH8
	CH <sub>4</sub> Leakage	CO <sub>2</sub> Recovery Stream	OptoAST	HH9	

Industry	Process Plant	Measurement Parameter	Stream Sample Overview	Sample Interface	Application Note
Syngas SNG	SNG		IGCC Plant SNG Production Analytics Overview		SY0
		Composition/CH <sub>4</sub>	Raw Syngas from Gasifier Effluent	OptoDRS	SY1
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Syngas after Scrubber	OptoDRS	SY2
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Raw Syngas from Other Trains	OptoDRS	SY3
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Common Syngas Header after Scrubbers	OptoDRS	SY4
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Shift Converter Outlet	OptoDRS	SY5
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	CO <sub>2</sub> Absorber Outlet	OptoDRS	SY6
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	SNG at Methanator Outlet	OptoAST	SY7
		Composition/CH <sub>4</sub> /H <sub>2</sub> /CO/CO <sub>2</sub>	SNG to Pipeline	OptoAST	SY8
		Composition/CH <sub>4</sub> /H <sub>2</sub> /CO <sub>2</sub> /N <sub>2</sub>	CO <sub>2</sub> Recovery Stream	OptoAST	SY9
Methanol	Methanol Plant		Methanol Production Analytics Overview		ME0
		Carbon Number	Natural Gas Feed to Primary Reformer	OptoAST	ME1
		BTU	Fuel Gas to Reformer Furnaces	OptoAST	ME2
		Composition/CH <sub>4</sub>	Raw Syngas - Primary Reformer Outlet	OptoDRS	ME3
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Raw Syngas - Secondary Reformer Outlet	OptoDRS	ME4
		Composition/CH <sub>4</sub>	Raw Syngas from Gasifier Effluent	OptoDRS	ME5
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Syngas after Scrubber	OptoDRS	ME6
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Make-up Syngas	OptoAST	ME7
		Composition/H <sub>2</sub> /CO/CO <sub>2</sub>	Syngas to Methanol Reactor	OptoAST	ME8
Composition	Methanol Synthesis Loop Recycle	OptoAST	ME9		

### Liquid-Phase Applications

Industry	Process Plant	Measurement Parameter	Stream Sample Overview	Analyzer Platform	Sample Interface	Application Note
Liquefied Natural Gas	LNG	Composition/BTU	LNG Custody Transfer	Rxn4	Pilot Probe	LN1
		Composition	LNG Natural Gas Liquefaction	Optograf	Pilot Probe	LN2
		Composition/Wobbe Index	LNG Natural Gas Quality	Rxn4	Pilot Probe	LN3
		Composition	LNG Rundown to Storage	Optograf	Pilot Probe	LN4
		Composition/BTU	LNG Truck Loading	Rxn4	Pilot Probe	LN5
		Composition/BTU	LNG Bunkering	Rxn4	Pilot Probe	LN6

## Raman Analyzers

Using the OptoAST™ and OptoDRS™ sample interfaces, the Optograf™ Analyzer is able to analyze hot, wet, and particle-laden gas phase streams at the sample tap, often at process temperature and pressure. Using the Pilot™ probe, the Rxn4 and Optograf Analyzers are able to analyze LNG and Mixed Refrigerants in the cryogenic liquid phase, avoiding the need for a vaporizer. An optional probe retraction interface is available to enable the Pilot probe to be inserted and removed from flowing streams without requiring process shutdown.

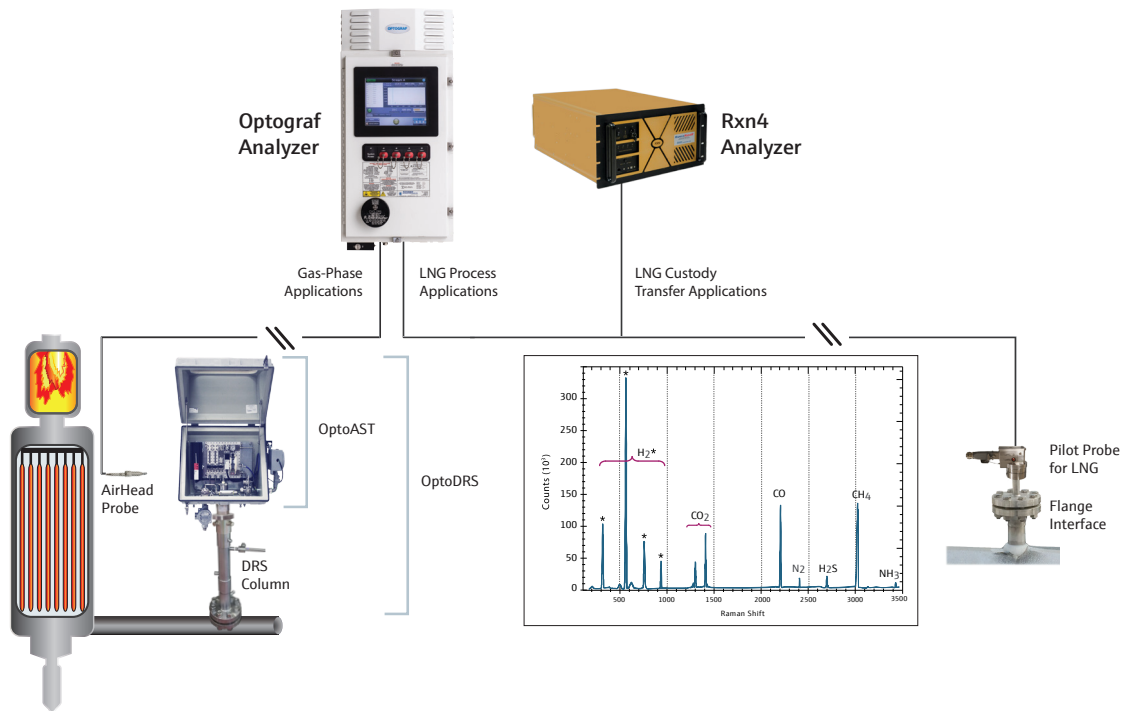


Rxn4™ Analyzer

Optograf™ Analyzer

AirHead™  
Fiber Optic ProbePilot™  
Fiber Optic ProbePilot Probe  
Retraction InterfaceOptoAST™  
Sample InterfaceOptoDRS™  
Sample Interface

# Analyzer Guide



## Sample Streams

- Installed at the sample tap
- Syngas Sample Streams
  - Reformers
  - Gasifiers
  - Shift Converters
  - PSA
  - Methanators
  - Synthesis Loops
    - Ammonia
    - Methanol
- LNG Sample Streams
  - LNG Custody Transfer
  - Mixed Refrigerant Liquids
  - Mixed Refrigerant Gases
  - LNG Quality Adjustment
  - LPG

## Sample Interface

- Non-extractive Optical Probe
- Multiple Options for Syngas
  - Conventional (2D)
  - OptoAST
    - Moderate Temp and Dry
  - OptoDRS
    - Particle-laden, Hot, Wet
- Pilot™ probe for cryogenic liquids
  - Direct-coupled/fast loop
  - Retractable option
- AirHead™ probe for gas streams
- No Flare
- Works at process P and T
- Class I/Div 1; Zone 1

## Analysis Result

- Full stream composition
- Peak areas proportional to concentration
- Simple method-based analysis (no complex models)
- BTU/Wobbe Index output

## Base Unit

- Laser-based analyzer
- No vaporizer for LNG
- No columns or carrier gas
- No stream switching
- No sample transport
- Analyze 4 independent streams at sequentially (Rxn4 Analyzer) or simultaneously (Optograf Analyzer)
- Rxn4: General purpose (GP) area
- Optograf: Class I/Div 2; Zone 2

## Contact

[www.spectrasensors.com/contact](http://www.spectrasensors.com/contact)



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