Shimadzu System GC Solutions Guide for Hydrocarbon Processing Industry

Our Reliability and Performance To Help You Stay Productive And Competitive
For more than six decades, Shimadzu has been building gas chromatography products and remains committed to building the best GC products in the world. Throughout our long history, the customer’s needs have always been central to all our design, manufacturing, and testing processes.

As part of this continuing commitment, we developed the system GC solutions for hydrocarbon processing industry (HPI), which provides our customers with the best reliable analytical solution products available anywhere.

From characterization of raw crude and natural gas to monitoring production and quality of refined chemicals and alternative fuels, Shimadzu is committed to provide the most complete GC analyzers portfolio. Shimadzu’s HPI GC analyzers are built on reputation of reliable and quality hardware with technical expertise. Our solutions ranges from basic system modification with chemically deactivated material and customized columns in system to quantify trace contaminants in petrochemical streams to a complex multi-valves system for characterization of diverse components in a product.

The following pages will show an overview of Shimadzu’s complete HPI GC analyzer solutions which include:

- More than 100 factory tested GC analyzers developed to comply industry standards such as ASTM, GPA, ISO, UOP etc.
- Customized GC analyzers configured and tested to your application’s pre-determined specifications.
- Customized instruments and tools designed, delivered and supported by Shimadzu and its partners.

Nevertheless when you need pre-configured or customized analyzers, Shimadzu helps you and your team to reduce time spend on application development and improve your productivity.
Shimadzu System GC
Solutions proven and committed to meet the demands of your business and industry.

INTRODUCTION
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ɾ Customized instruments and tools designed, delivered and supported by Shimadzu and its partners. Nevertheless when you need pre-configured or customized analyzers, Shimadzu helps you and your team to reduce time spent on application development and improve your productivity.

Pre-installation
ɾ Each System GC analyzer is factory pre-configured and pre-tested.
ɾ Field installation and performance verification by our factory trained engineer or certified partner engineer.

Post-installation
ɾ Continuous support by Shimadzu expert consultation and partners to overcome your analytical challenges.

Shimadzu System GC Analyzers reflect stringent industry standards and quality control:

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Nexis GC-2030, Shimadzu’s premier gas chromatograph, offers a modern approach to a classic chromatographic technique. Designed with the user in mind, new innovative features, exceptional performance and high throughput capabilities will elevate your lab to the next level.

Features

High-Sensitivity Detectors Support a Wide Variety of Analyses

Barrier Discharge Ionization Detector (BID-2030)

Electron Capture Detector (ECD-2010 Exceed)

Flame Ionization Detector (FID-2030)

Flame Photometric Detector (FPD-2030)
Intelligent Flow Controller with Exceptional Reproducibility

A new advanced flow controller (AFC) has been developed to include a CPU. It supports carrier gas constant linear velocity control, constant flowrate control, constant pressure control, and various other control modes and achieves exceptionally high reproducibility for ultra-high-speed and ultra-high-precision control modes. Multi-step programs can be created for each control mode as well. The split line filter can be replaced with hands. Internal contamination can be confirmed visually to ensure filters are replaced at the proper timing.

GC Systems Customized for Specific Needs

- **Gasoline analysis system**
  This system is able to measure specific substances in gasoline, such as oxygenates.

- **Inorganic gas analysis system**
  This system is able to measure hydrogen and various other inorganic gases.

- **Refrery gas analysis system**
  This system is able to analyze components in gas from petroleum refineries.

- **Hydrocarbon analysis system**
  This system is able to measure hydrocarbons that are generated, such as from catalyst reactions.

- **Natural gas analysis system**
  This system is able to analyze components in natural gas, such as shale gas.

- **Public utility natural gas analysis system**
  This system is able to calculate calorific values from measurements of natural gas.

Faster Analysis with Hydrogen Carrier Gas

Hydrogen can be a safe and highly effective carrier gas. As a highly efficient carrier gas with a flat Van Deemter curve, it maintains its separation efficiency across a wide linear velocity range. This makes it both a good substitute for Helium and also a great choice for speeding up analysis times. We know safety is paramount, which is why the Nexis GC-2030 offers an optional built-in hydrogen sensor*. It not only maintains a safe standby mode for early detection of any potential leaks, but also shuts off hydrogen flow. The main unit also includes an automatic carrier gas leak check function, which is very helpful when using hydrogen as a carrier gas.

* Optional

---

<table>
<thead>
<tr>
<th></th>
<th>Peak Area Value (RSD%)</th>
<th>Retention Time (RSD%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decane</td>
<td>0.29</td>
<td>0.005</td>
</tr>
<tr>
<td>1-Octanol</td>
<td>0.32</td>
<td>0.004</td>
</tr>
<tr>
<td>Undecane</td>
<td>0.28</td>
<td>0.004</td>
</tr>
<tr>
<td>2,6-Dimethylaniline</td>
<td>0.29</td>
<td>0.003</td>
</tr>
<tr>
<td>n-Methyl Nonanoate</td>
<td>0.24</td>
<td>0.003</td>
</tr>
<tr>
<td>n-Methyl Decanoate</td>
<td>0.25</td>
<td>0.002</td>
</tr>
<tr>
<td>Dicyclohexylamine</td>
<td>0.23</td>
<td>0.003</td>
</tr>
<tr>
<td>n-Methyl Laurate</td>
<td>0.27</td>
<td>0.004</td>
</tr>
</tbody>
</table>

---

**Results from Analyzing a Grob Test Mix Standard Ten Consecutive Times**

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**Flow Controller (AFC-2030)**

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**Split filter**

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**Valve**

---

**Flow Controller**

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**Hydrogen Sensor Monitors Inside the GC Oven**

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**Hydrogen sensor**
Natural gas is a fossil fuel widely used for town gas, electric generation and organic chemicals as feedstock.

Natural gas contains mainly methane and other light hydrocarbons and also contains a small amounts of carbon dioxide, oxygen, nitrogen, hydrogen sulfide, or helium as impurities.

For the trading of natural gas, calorific value and purity are measured. Some of impurities such as hydrogen sulfide must be controlled before using for producing chemicals in next streams in the plant.

Shimadzu natural gas analyzers measure permanent gases and light hydrocarbons from C1 to C5 with C6+ backflush, as well as extended type has function for measuring middle hydrocarbons up to C15. Our factory assembles and tests our GC analyzers for the chemical composition analysis of natural gas and liquid natural gas. System is equipped with software that outputs reports according to ISO, BTU requirements.
Natural Gas Analyzer
Nexis GC-2030NGA1 with Hydrogen / Nexis GC-2030NGA2 without Hydrogen

Analyzer Description

System Configuration:
- 3 valves / 6 packed columns / 2 TCDs

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analysed:
- C1 to C5 (Methane, Ethane, Propane, i-Butane, n-Butane, i-Pentane, n-Pentane)
- C6+ as Backflush
- He, H2, O2, N2, H2S, CO, CO2

Typical Concentration Range:
- 0.01 % mol for all components except for H2S and CH4, 0.20 % mol for H2S and 20 % mol for CH4

Reference Method:
- ASTM D-1945, D-3588 and GPA2261

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium analysis
- Rugged packed columns
- 25 mins analysis time
- BTU and Specific Gravity Calorific Calculation software provided as per ASTM D-3588

Typical Chromatogram

TCD-1

<table>
<thead>
<tr>
<th>Peak</th>
<th>Substance</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CH4 (1.43 %)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>N2 (9.9 %)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CH2 (73.13 %)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CO (0.89 %)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CH3 (0.54 %)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CO2 (1.91 %)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CH4 (2.21 %)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>H2 (0.87 %)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CH2 (1.06 %)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>H2S (2.03 %)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CH3 (1.2 %)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CH4 (2.06 %)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CH2 (0.34 %)</td>
<td></td>
</tr>
</tbody>
</table>

TCD-2

<table>
<thead>
<tr>
<th>Peak</th>
<th>Substance</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>He</td>
<td>0.49 %</td>
</tr>
<tr>
<td>2</td>
<td>H2</td>
<td>1.45 %</td>
</tr>
</tbody>
</table>
Fast Natural Gas Analyzer
Nexis GC-2030FNGA1 with Hydrogen / Nexis GC-2030FNGA2 without Hydrogen

Analyzer Description

System Configuration:
- 4 valves / 8 columns (packed and capillary) / 2 TCDs / FID

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analysed:
- C1 to C5 (Methane, Ethane, Propane, i-Butane, n-Butane, i-Pentane, n-Pentane)
- C6+ as Backflush
- He, H2, O2, N2, H2S, CO, CO2

Typical Concentration Range:
- 0.01% mol for permanent gases and C2 hydrocarbon on TCD, 10 ppm for C3 to C6+ hydrocarbons on FID except for H2S and CH4, 0.10% mol for H2S and 20% mol for CH4

Reference Method:
- ASTM D-1945, D-3588 and GPA2261

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium analysis
- FID channel for C3 to C6+ hydrocarbons
- Rugged packed and capillary columns
- 10 mins analysis time
- BTU calorific calculation software provided

Typical Chromatogram

FID

TCD-1

TCD-2
Extended Natural Gas Analyzer (Single Oven)
Nexis GC-2030ENGA1

Analyzer Description

System Configuration:
- 4 valves / 7 columns (packed and capillary) / 2 TCDs / FID

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analysed:
- C1 to C14 hydrocarbons
- He, H2, O2, N2, H2S, CO, CO2

Typical Concentration Range:
- 0.01 % mol for permanent gases and C2 hydrocarbon on TCD, 10 ppm for C3 to C13 hydrocarbons on FID except for H2S and CH4, 0.10 % mol for H2S and 20 % mol for methane

Reference Method:
- ASTM D-1945, D-3588 and GPA2286

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium analysis
- FID channel for C3 to C13 hydrocarbons
- Rugged packed and capillary columns
- 30 mins analysis time
- BTU Calorific and Specific Gravity Calculation Software provided as per ASTM D-3588

Typical Chromatogram

FID

TCD-1

TCD-2
Extended Natural Gas Analyzer (Dual Oven)
Nexis GC-2030ENGA2

Analyzer Description

System Configuration:
- 4 valves / 7 columns (packed and capillary) / 2 TCDs / FID
- Dual Oven

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analyzed:
- C1 to C14 hydrocarbons
- He, H2, O2, N2, H2S, CO, CO2

Typical Concentration Range:
- 0.01 % mol for permanent gases and C2 hydrocarbon on TCD, 10 ppm for C3 to C14 hydrocarbons on FID except for H2S and CH4, 0.10 % mol for H2S and 20 % mol for CH4

Reference Method:
- ASTM D-1945, D-3588 and GPA2286

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium analysis
- FID channel for C3 to C14 hydrocarbons in 2nd GC oven
- Rugged packed and capillary columns

Typical Chromatogram

FID

TCD-1

TCD-2
Natural Gas Analyzer (ISO6974-3)
Nexis GC-2030ISO6974-3

Analyzer Description

System Configuration:
- 2 valves / 3 columns (packed) / 2 TCDs / FID

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analyzed:
- C1 to C8 hydrocarbons
- He, H2, O2, N2, CO2

Typical Concentration Range:
- 0.1 % mol for permanent gases (O2, N2, CO2) on TCD, 1 ppm for C4 to C8 hydrocarbons on FID except for C3, H2 / He and CH4, 0.001 % mol for C3, 0.01 % for H2 / He and 50 % mol for CH4

Reference Method:
- ISO6974-3, ISO6976

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium analysis
- FID channel for C4 to C8 hydrocarbons
- Rugged packed columns
- 20 mins analysis time
- ISO Calorific and Specific Gravity Calculation Software provided as per ISO6976.

Typical Chromatogram

TCD-1

TCD-2
Natural Gas Analyzer (ISO6974-4)
Nexis GC-2030ISO6974-4

Analyzer Description

System Configuration:
- 1 valve / 2 columns (packed) / TCD

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- N₂, CO₂

Typical Concentration Range:
- 0.001 % mol for permanent gases on TCD, except for CH₄, 75 % mol for CH₄

Reference Method:
- ISO6974-4, ISO6976

Features
- Single TCD channel
- Rugged packed columns
- 22 mins analysis time
- ISO Calorific and Specific Gravity Calculation Software provided as per ISO6976.

Typical Chromatogram

<table>
<thead>
<tr>
<th>TCD-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV (x10,000)</td>
</tr>
<tr>
<td>0.00</td>
</tr>
<tr>
<td>2.5</td>
</tr>
</tbody>
</table>

1: n-C₆H₁₄ (0.49 %)
2: n-C₅H₁₂ (9.68 %)
3: CH₄ (67.22 %)
4: CO₂ (1.96 %)
5: C₂H₆ (1.87 %)
6: C₃H₈ (1.02 %)
7: i-C₆H₁₄ (0.97 %)
8: i-C₅H₁₂ (0.99 %)
9: i-C₄H₁₀ (0.5 %)
10: n-C₃H₆ (0.5 %)
BID Ultra-Fast Natural Gas Analyzer
Nexis GC-2030 BIDUFNGA

Analyzer Description

System Configuration:
- 3 valves / 6 columns (packed and capillary) / BID / FID

Sample Information:
- Natural gas or similar gaseous mixture

Compounds Analyzed:
- C1 to C6+ hydrocarbons
- H2, O2, N2, CO, CO2, C2H6, C2H4, C2H2, H2S

Typical Concentration Range:
- 0.001 % mol for permanent gases and C2 hydrocarbons on BID, except for CH4 and H2S, 20 % mol for CH4 and 0.01 % for H2S

Reference Method:
- ASTM D-1945, D-3588, GPA-2261

Features
- Single BID channel
- FID for C1 to C6+ hydrocarbons
- Rugged packed and capillary columns
- 5 mins analysis time
- BTU Calorific and Specific Gravity Calculation Software provided as per D-3588

Typical Chromatogram

FID

<table>
<thead>
<tr>
<th>Retention Time (min)</th>
<th>Peak Number</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
<td>n-C6H12 (0.57%)</td>
</tr>
<tr>
<td>1.0</td>
<td>2</td>
<td>CH4 (6.76%)</td>
</tr>
<tr>
<td>1.5</td>
<td>3</td>
<td>C2H6 (1.81%)</td>
</tr>
<tr>
<td>2.0</td>
<td>4</td>
<td>C3H8 (0.91%)</td>
</tr>
<tr>
<td>2.5</td>
<td>5</td>
<td>i-C4H10 (0.54%)</td>
</tr>
<tr>
<td>3.0</td>
<td>6</td>
<td>n-C4H10 (0.92%)</td>
</tr>
</tbody>
</table>

BID

<table>
<thead>
<tr>
<th>Retention Time (min)</th>
<th>Peak Number</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1</td>
<td>Hz (16.02%)</td>
</tr>
<tr>
<td>1.0</td>
<td>2</td>
<td>O2 (4.82%)</td>
</tr>
<tr>
<td>1.5</td>
<td>3</td>
<td>N2 (9.88%)</td>
</tr>
<tr>
<td>2.0</td>
<td>4</td>
<td>CO (1.02%)</td>
</tr>
<tr>
<td>2.5</td>
<td>5</td>
<td>CO2 (1.96%)</td>
</tr>
<tr>
<td>3.0</td>
<td>6</td>
<td>C2H6 (1%)</td>
</tr>
<tr>
<td>3.5</td>
<td>7</td>
<td>CH4 (1%)</td>
</tr>
<tr>
<td>4.0</td>
<td>8</td>
<td>C2H2 (0.51%)</td>
</tr>
<tr>
<td>4.5</td>
<td>9</td>
<td>H2S (0.53%)</td>
</tr>
</tbody>
</table>
Refinery Gas

Refineries distillates crude oil into different fractions and finally produces converts fuels and feedstock for downstream chemical processes such as gasoline, naphtha, fuels, heavy oils, lubricants. Refinery gases after distillation and cracking process, they are rich in variation that depend on type of processing stage. Refinery gases contain permanent gases such as oxygen, nitrogen, carbon dioxide and saturated and unsaturated hydrocarbons from C1 to C5. Refinery gas composition analysis is very complex and high-speed analysis is required for quick feedback to processing control. Shimadzu refinery gas analyzers measure permanent gases and light hydrocarbons from C1 to C5 with C6+ backflush, as well as high speed type analyzers can give results within only 6 minutes. Our factory assembled and tested our GC analyzer for the chemical composition analysis of refinery gas.
Refrinery Gas Analyzer
Nexis GC-2030FRGA1 with Hydrogen / Nexis GC-2030FRGA2 without Hydrogen

Analyzer Description

System Configuration:
- 4 valves / 8 columns (packed and capillary) / 2 TCDs / FID

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- He, H2, O2, N2, CO, CO2, C2H6, C2H4, C3H6, H2S

Typical Concentration Range:
- 0.01 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.1 % for H2S
- 0.001 % for C1 to C6+ hydrocarbons

Reference Method:
- ASTM D-1945, D-1946, D-3588, GPA-2261

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium
- FID for C1 to C6+ hydrocarbons
- Rugged packed and capillary columns
- 10 mins analysis time
- BTU Calorific and Specific Gravity Calculation Software provided as per D-3588

Typical Chromatogram

FID

TCD-1

TCD-2
High Speed Refinery Gas Analyzer
Nexis GC-2030HSRGA1 with Hydrogen / Nexis GC-2030HSRGA2 without Hydrogen

Analyzer Description

System Configuration:
- 4 valves / 8 columns (packed and capillary) / 2 TCDs / FID

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- He, H2, O2, N2, CO, CO2, C2H6, C2H4, C2H2, H2S

Typical Concentration Range:
- 0.01% mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.1% for H2S
- 0.01% for C1 to C6+ hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2261

Features
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium
- FID for C1 to C6+ hydrocarbons
- Rugged packed and capillary columns
- 6 mins analysis time
- BTU Calorific and Specific Gravity Calculation Software provided as per D-3588

Typical Chromatogram

FID

TCD-1

TCD-2
Extended Refinery Gas Analyzer
Nexis GC-2030ERGA1 with Hydrogen / Nexis GC-2030ERGA2 without Hydrogen

Analyzer Description

System Configuration:
- 4 valves / 9 columns (packed and capillary) / 2 TCDs / 2 FIDs
- Dual Ovens

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C14 hydrocarbons
- He, H2, O2, N2, CO, CO2, C2H6, C2H4, C2H2, H2S

Typical Concentration Range:
- 0.01 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.1 % for H2S
- 0.001 % for C3 to C13 hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2286

Features
- Dual TCD channels
- FID for C3 to C6+ hydrocarbons
- 2nd FID in second oven for C6 to C14 hydrocarbons
- Rugged packed and capillary columns
- 10 mins analysis time
- BTU Calorific and Specific Gravity Calculation

Typical Chromatogram

FID (C6-C13)

TCD-1

TCD-2

FID (C6+, C3-C5)
Complete Extended Refinery Gas Analyzer
Nexis GC-2030CERGA1

Analyzer Description

System Configuration:
- 5 valves / 9 columns (packed and capillary) / 2 TCDs / 2 FIDs
- Dual GC Ovens

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C3 to C14 hydrocarbons
- He, H2, O2, N2, CO, CO2, C2H6, C2H4, C2H2, H2S

Typical Concentration Range:
- 0.01 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.1 % for H2S
- 0.001 % for C3 to C14 hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2286

Features
- Multi sample-type injectors
  - Vaporizer/ Liquid sampling valve/ Gas sample injection
- Dual TCD channels
- Dedicated channel for Hydrogen and Helium
- FID for C3 to C6+ hydrocarbons
- 2nd FID for C6 to C14 hydrocarbons in 2nd GC oven
- Rugged packed and capillary columns
- Dedicated software for switching analytical flow and sample injection for easy-to-use

Typical Chromatogram

FID-1

FID-2

TCD-1

TCD-2
BID Ultra-Fast Refinery Gas Analyzer
Nexis GC-2030 BIDUFRGA

Analyzer Description

System Configuration:
- 3 valves / 6 columns (packed and capillary) / BID / FID

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- H2, O2, N2, CO, CO2, C2H6, C2H4, C2H2, H2S

Typical Concentration Range:
- 0.001 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.1 % mol for H2S
- 0.001 % for C1 to C6+ hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2261

Features
- 1 BID channel
- FID for C1 to C6+ hydrocarbons
- Rugged packed and capillary columns
- 6 mins analysis time
- BTU Calorific and Specific Gravity Calculation Software provided as per D-3588

Typical Chromatogram

FID

BID
BID Extended Refinery Gas Analyzer (Single Oven)
Nexis GC-2030 BIDERGA-S

Analyzer Description

System Configuration:
- 4 valves / 7 columns (packed and capillary) / BID / 2 FIDs

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- C6 to C14 hydrocarbons
- H2, O2, N2, CO, CO2, C2H6, C2H4, C3H8, H2S

Typical Concentration Range:
- 0.001 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.01 % mol for H2S
- 0.001 % for C1 to C6+ hydrocarbons
- 0.001 % for C6 to C13 hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2286

Features
- 1 BID channel
- FID for C1 to C6+ hydrocarbons
- 2nd FID for C6 to C13 hydrocarbons
- Rugged packed and capillary columns
- 10 mins analysis time

Typical Chromatogram

FID-1

```
1: C6H6 (0.11 %)
2: CH4 (53 %)
3: C2H6 (1 %)
4: C3H8 (1 %)
5: C5H12 (10.7 %)
6: C2H2 (1 %)
7: i-C4H10 (1.87 %)
8: n-C4H10 (1.99 %)
9: C6H6 (0.51 %)
```

FID-2

```
1: C6H6 (0.11 %)
2: CH4 (0.016 %)
3: C2H6 (0.004 %)
4: C3H8 (0.004 %)
5: C5H12 (0.001 %)
6: C2H2 (0.001 %)
7: C4H10 (0.002 %)
8: C6H6 (0.019 %)
```

BID

```
1: H2 (16.02 %)
2: O2 (4.82 %)
3: N2 (0.98 %)
4: CO (1.02 %)
5: CO2 (1.96 %)
6: CH4 (1 %)
7: C2H4 (1 %)
8: C2H6 (0.51 %)
9: H2S (0.53 %)
```
BID Extended Refinery Gas Analyzer (Dual Oven)
Nexis GC-2030 BIDERGA-D

Analyzer Description

System Configuration:
- 4 valves / 7 columns (packed and capillary) / BID / 2 FIDs

Sample Information:
- Refined gas or similar gaseous mixture

Compounds Analysed:
- C1 to C6+ hydrocarbons
- C6 to C14 hydrocarbons
- H2, O2, N2, CO, CO2, C2H6, C2H4, C3H8, H2S

Typical Concentration Range:
- 0.001 % mol for permanent gases and C2 hydrocarbons on TCD, except for H2S, 0.01 % mol for H2S
- 0.001 % for C1 to C6+ hydrocarbons
- 0.001 % for C6 to C14 hydrocarbons

Reference Method:
- ASTM D-1946, D-1945, D-3588, GPA-2286

Features
- 1 BID channel
- FID for C1 to C6+ hydrocarbons
- 2nd FID for C6 to C14 hydrocarbons
- Rugged packed and capillary columns
- 10 mins analysis time

Typical Chromatogram

FID-1

BID

FID-2
LPG is mainly composed of propane and butane which are liquefied and supplied pressurized cylinders more easily than the other fuels. Therefore, it is useful for heating and cooking, industrial use in remote areas.

LPG is mixture of many kinds of resources such as petroleum and natural gases, byproduct of the other chemical processing, etc. It is critical to measure composite and calculate heating value.

Shimadzu LPG analyzers are configured with vaporization apparatus for injectors, and FID/TCD for detectors to comply with customers’ requirement. ISO6976/BTU calorific value software outputs in accordance with each industry standard. Both of hardware and software support for complete work.
Hydrocarbons in LPG Analyzer

Nexis GC-2030LPGHC1 with Vaporiser / Nexis GC-2030LPGHC2 with Liquid Sampling Valve

Analyzer Description

System Configuration:
- 1 valve / 1 column (capillary) / Split and Splitless injector / FID / Vaporiser

Sample Information:
- Liquefied petroleum gas

Compounds Analysed:
- Hydrocarbons (C1 to C6)

Typical Concentration Range:
- 0.001 %

Reference Method:
- ASTM D-2163

Features
- Single channel with Split / Splitless injector, vaporiser or liquid sampling valve for liquefied petroleum gas
- Configured with PLOT Alumina for separation of the C1 to C6 hydrocarbons
- 30 mins analysis time

Typical Chromatogram

![Typical Chromatogram](image)
Measuring feedstock impurities at progressively lower concentrations is important for processing control and keeping final product quality at high level. Recently customers and regulators requirements for ethylene, propylene monomer feedstock are increasing. Not only for chemical industries, but also for food and semiconductor industries, purity of feedstock is very critical and may determine customer’s final profit. Less contaminants can also keep less damage to equipment and assets for production. For example it can minimize consumption of high price catalyst in the plant.
Shimadzu trace gas analyzers have a wide range line-up to meet a customer’s specific requirements and needs. We can also supply customized-analyzer to you confirm the purity of products. Our factory assembles and tests our GC analyzers for the chemical composition analysis of special gases standard.
Trace Gases Analyzer - CO₂ / CO / CH₄
Nexis GC-2030CCC1

Analyzer Description

**System Configuration:**
- 1 valve / 2 columns (packed) / methanizer FID

**Sample Information:**
- H₂ or light gaseous hydrocarbons

**Compounds Analysed:**
- CO₂, CO and CH₄

**Typical Concentration Range:**
- 1 ppm for CO₂, CO and CH₄

**Reference Method:**
- UOP 603

**Features**
- Single channel with rugged pack column
- Trace detection level of CO₂ and CO analysis by conversion to CH₄ and detect by methanizer FID
- 8 mins analysis time

Typical Chromatogram

![Typical Chromatogram](image)

1: CO (4.8 ppm)
2: CH₄ (5.2 ppm)
3: CO₂ (5.0 ppm)
Trace Gases Analyzer - CO₂ / CO / CH₄
Nexis GC-2030CCC2

Analyzer Description

System Configuration:
• 1 valve / 2 columns (packed) / TCD

Sample Information:
• Light gas (H₂, O₂, N₂, Ar)

Compounds Analyzed:
• CO₂, CO and CH₄

Typical Concentration Range:
• 0.01 % for CO₂, CO and CH₄

Features

• Single TCD channel with rugged pack column
• % detection level of CO₂, CH₄ and CO analysis
• 18 mins analysis time

Typical Chromatogram
Trace Gases Analyzer - CO₂ / CO / CH₄
Nexis GC-2030CCC3

Analyzer Description

System Configuration:
- 2 valves / 4 columns (packed) / TCD / methanizer FID

Sample Information:
- H₂ or light gaseous hydrocarbons or Light gas (H₂, O₂, N₂, Ar)

Compounds Analysed:
- CO₂, CO and CH₄

Typical Concentration Range:
- 1 ppm for CO₂, CO and CH₄
- 0.01% for CO₂, CO and CH₄

Reference Method:
- UOP 603

Features

- Separate channels with rugged pack columns
- % detection level of CO₂, CH₄ and CO analysis
- Trace detection level of CO₂ and CO analysis by conversion to CH₄ and detected by methanizer FID
- 16 mins analysis time

Typical Chromatogram

FID

TCD
Trace Gases Analyzer - CO$_2$ / CO / CH$_4$

**Analyzer Description**

**System Configuration:**
- 2 valves / 4 columns (packed) / methanizer FID

**Sample Information:**
- H$_2$ or light gaseous hydrocarbons

**Compounds Analysed:**
- CO$_2$, CO and CH$_4$

**Typical Concentration Range:**
- 1 ppm for CO$_2$, CO and CH$_4$
  * O$_2$ concentration in sample should be 1 % or lower

**Reference Method:**
- UOP 603

---

**Features**

- Single channel with rugged pack columns
- Trace detection level of CO$_2$ and CO analysis by conversion to CH$_4$ and detected by methanizer FID
- 11 mins analysis time

---

**Typical Chromatogram**

[Typical Chromatogram Image]

1: CH$_4$ (5.1 ppm)
2: CO (4.9 ppm)
3: CO$_2$ (4.9 ppm)
Trace Gases Analyzer - CO\textsubscript{2} / CO / CH\textsubscript{4}

Nexis GC-2030TCC

Analyzer Description

System Configuration:
- 3 valves / 5 columns (packed) / methanizer FID

Sample Information:
- C2 or light gaseous hydrocarbons

Compounds Analysed:
- CO\textsubscript{2}, CO and CH\textsubscript{4}

Typical Concentration Range:
- 0.5 ppm for CO\textsubscript{2}, CO and CH\textsubscript{4}

Reference Method:
- ASTM D-2504

Features
- Single channel with rugged pack columns with vent valve
- Trace detection level of CO\textsubscript{2} and CO analysis by conversion to CH\textsubscript{4} and detected by methanizer FID
- 20 mins analysis time

 Typical Chromatogram

![](image)
Trace H₂ Analyzer
Nexis GC-2030TH2

Analyzer Description

System Configuration:
- 1 valve / 2 columns (packed) / TCD

Sample Information:
- Municipal gas or similar gaseous mixture

Compounds Analyzed:
- H₂ and O₂

Typical Concentration Range:
- 50 ppm for permanent gases (H₂)

Reference Method:
- ASTM D-2504

Features
- TCD channel
- Trace detection level
- Rugged packed columns
- 5 mins analysis time

Typical Chromatogram
Trace \(O_2\) and \(N_2\) Analyzer
Nexis GC-2030TNO

---

**Analyzer Description**

**System Configuration:**
- 1 valve / 2 columns (packed) / TCD

**Sample Information:**
- Municipal gas or similar gaseous mixture

**Compounds Analysed:**
- \(O_2\) and \(N_2\)

**Typical Concentration Range:**
- 50 ppm for permanent gases (\(O_2\) and \(N_2\))

**Reference Method:**
- ASTM D-2504

---

**Features**

- TCD channel
- Trace detection level
- Rugged packed columns
- 5 mins analysis time

---

**Typical Chromatogram**

![Typical Chromatogram](image)

1. \(O_2\) (49.6 ppm)
2. \(N_2\) (50.2 ppm)

---

**System Configuration:**

1. Valve / 2 columns (packed) / TCD

**Sample Information:**

- Municipal gas or similar gaseous mixture

**Compounds Analysed:**

- \(O_2\) and \(N_2\)

**Typical Concentration Range:**

- 50 ppm for permanent gases (\(O_2\) and \(N_2\))

**Reference Method:**

- ASTM D-2504

---

**Features**

- TCD channel
- Trace detection level
- Rugged packed columns
- 5 mins analysis time

---

**Typical Chromatogram**

![Typical Chromatogram](image)

1. \(O_2\) (49.6 ppm)
2. \(N_2\) (50.2 ppm)
Methane Purity Analyzer
Nexis GC-2030HC2

Analyzer Description

System Configuration:
- 3 valves / 6 columns (packed) / 2 TCDs

Sample Information:
- Municipal gas or similar gaseous mixture

Compounds Analyzed:
- H₂, Ar/O₂, N₂, CO, CO₂, C₂H₆, C₂H₄, C₂H₂

Typical Concentration Range:
- 50 ppm mol for permanent gases (H₂, Ar/O₂, N₂, CH₄, CO, CO₂) and C₂ hydrocarbons

Features
- Dual TCD channels
- Rugged packed columns
- 10 mins analysis time

Typical Chromatogram

TCD-1

TCD-2
Sulfurs present naturally in natural gas and crude oil. Controlling sulfur compounds at low level are very strict for keeping fuels and hydrocarbon products quality. Sulfur impurities in fuels also have to be limited under each country regulation. Therefore trace sulfurs analysis is very important. Trace sulfur contaminants can also contribute to equipment corrosion and reduction of product yields. They can cause catalyst degradation, poisoning and contamination and production down time.

Sulfur oxides (SOx) are harmful to human health and the environment. Emission with sulfurs cause acid rains globally. EPA recently shows regulation to limit presence of sulfur contaminants in hydrocarbon products.

Shimadzu sulfur analyzers measure trace level sulfurs with wealth of experiences. Our factory assembled and tested our GC analyzers for the chemical composition analysis with good quality sulfur standards.
Trace Sulfur Analyzer
Nexis GC-2030SUL1

Analyzer Description

System Configuration:
- 1 column (Packed) / FPD

Sample Information:
- Gaseous fuel

Compounds Analysed:
- H$_2$S, COS

Typical Concentration Range:
- 0.1 ppm for H$_2$S, COS

Features
- Can switch between Sulfur or Phosphorous mode for measurement
- Utilises packed column for gaseous fuel samples.
- 13 mins analysis time

Typical Chromatogram
Reformulated Gasoline is oxygenates deliberately added gasoline for increasing atmosphere cleanliness. Environmental regulators have set limitation on volatile organic compounds and other toxic chemicals from exhaust gasses. Fuel producer have to design fuels for keeping good engine efficiency and performance, and also watch the quality of feedstock such as naphtha and additive oxygenates. Shimadzu reformulated fuel analyzers measure oxygenates in the gasolines. Our factory assembled and tested our GC analyzers according to ASTM refined methods.
Reformulated Fuel Analyzer - BT
Nexis GC-2030BTA1

Analyzer Description

System Configuration:
- 1 valve / 2 columns (Packed) / WBI Injector / FID

Sample Information:
- Aviation and motor gasoline fuel

Compounds Analysed:
- Benzene, Toluene and Butanone

Typical Concentration Range:
- 0.001 % for Benzene and 0.02 % for Toluene

Reference Method:
- ASTM D-3606

Features

- Single channel configured with dual packed columns to determine benzene and toluene in aviation and motor gasoline fuel
- Independent heating valve system to prevent condensation of sample heavy components.
- 10 mins analysis time

Typical Chromatogram

![Typical Chromatogram](image)
Reformulated Fuel Analyzer - BT
Nexis GC-2030FBTA1

Analyzer Description

System Configuration:
- Flow Switch / 2 columns (capillary) / Split and Splitless Injector / FID

Sample Information:
- Aviation and motor gasoline fuel

Compounds Analysed:
- Benzene, Toluene and MEK

Typical Concentration Range:
- 1 ppm for Benzene and Toluene

Reference Method:
- ASTM D-3606

Features
- Single channel configured with dual capillary columns to determine benzene and toluene in aviation and motor gasoline fuel
- Flow switch technique to shorten analysis time (4 mins)

Typical Chromatogram
Reformulated Fuel Analyzer – Aromatics
Nexis GC-2030ACA1

Analyzer Description

System Configuration:
- 1 valve / 2 columns (capillary) / Split and Splitless Injector / FID

Sample Information:
- Aviation and motor gasoline fuel

Compounds Analysed:
- Benzene, toluene, 2-hexanone, ethylbenzene, xylene, C9 and heavier aromatics, total aromatics

Typical Concentration Range:
- 0.1 % for Benzene, 1 % for Toluene and 0.5 % for C8 aromatics

Reference Method:
- ASTM D-5580

Features
- Single channel configured with dual columns to determine benzene, toluene, ethylbenzene and xylene in finished gasoline fuel
- Configured with newly improved TCEP column to improve method stability
- 40 mins analysis time

Typical Chromatogram
Analyzer Description

System Configuration:
- 1 valve / 2 columns (packed and capillary) / Split and Splitless Injector / FID

Sample Information:
- Aviation and motor gasoline fuel

Compounds Analysed:
- Ethers and Alcohols

Typical Concentration Range:
- 0.1 % for Ethers and 0.1 % for Alcohols

Reference Method:
- ASTM D-4815

Features
- Single channel configured with dual columns to determine benzene, toluene, ethylbenzene and xylene in finished gasoline fuel
- Configured with newly improved TCEP column to improve method stability

Typical Chromatogram
Oxygenate Analyzer
Nexis GC-2030OAS3

Analyzer Description

System Configuration:
- 2 valves / 2 columns (capillary) / FID

Sample Information:
- LPG or naphtha

Typical Concentration Range:
- Hydrocarbons (C1 to C5 alcohols, C2 to C6 carbonyls/ethers)
- 1 ppm to 10,000 ppm

Reference Method:
- UOP 960

Features
- LPG sample is introduced LSV or vaporizer (optional)
- Configured with PLOT LOWOX column for separation of more than 30 kinds of hydrocarbons
- Hydrogen gas sensor for safety use of hydrogen carrier gas
Reformulated Fuel Analyzer - BT / ARO / OXY

Nexis GC-2030 3606-4815-5580-1

Analyzer Description

System Configuration:
- 2 valves / 4 columns (packed and capillary) / Split / Splitless and Packed Injector / FID / TCD

Sample Information:
- Aviation and motor gasoline fuel

Compounds Analysed:
- Benzene and Toluene
- MTBE, Ethers and Alcohols
- Benzene, toluene, 2-hexanone, ethylbenzene, xylene, C9 and heavier aromatics, total aromatics

Typical Concentration Range:
- 0.1 % for Benzene and 2 % for Toluene
- 0.1 % for Ethers and Alcohols
- 0.1 % for Benzene, 1 % for Toluene and 0.5 % for Ethylbenzene and Xylene, 5 % for C9 aromatics and 10 % for total aromatics

Reference Method:
- ASTM D-4815, D-5580, D-3606

Features
- Single channel configured with dual columns to determine benzene, toluene, ethylbenzene and xylene in finished gasoline fuel
- Configured with newly improved TCEP column to improve method stability
- 40 mins analysis time

Typical Chromatogram

FID ASTM-D3606

FID ASTM-D4815

FID ASTM-D5580
The purpose of detailed hydrocarbon analysis (DHA) is to determine the bulk hydrocarbon group type composition (PONA: Paraffins, Olefins, Naphthenes and Aromatics) of gasoline and other spark ignition engine fuels that contain oxygenate blends (Methanol, ethanol, MTBE, ETBE, and TAME).

Nexis GC-2030’s intelligent Advance Flow Controller realizes precise linear velocity control to provide accurate and stable analytical result.

Utilizing Envantage Dragon DHA software™*, bothering identification work of several hundreds of peaks will become easier. Misidentification will be also prevented thanks to preset database.

* Envantage DHA Dragon software is trademark of Envantage, Inc
Detailed Hydrocarbons Analyzer
Nexis GC-2030 PONA Series

**Analyzer Description**

**System Configuration:**
- 1 column (capillary) / Split or Splitless injector / FID

**Sample Information:**
- Spark ignition engine fuels, naphtha

**Compounds Analyzed:**
- Paraffins, Olefines, Naphthenes, Aromatics

**Typical Concentration Range:**
- 0.1 %

**Reference Method:**
- ASTM D-5134, D-6729, D-6730

---

**Features**

- Complies to method ASTM D-5134, D-6729, D-6730
- Includes Envantage Dragon software
  - Fast peaks identification and report processing
  - Automatic re-calculation when changes are made
  - Hydrocarbon group type filtering
  - Full preview and printing of report
  - Data files are saved as CDF (AIA) format and can be assessed by 3rd party applications that support AIA format file
  - Full reports are stored with results for easy retrieval without reprocessing

---

**Typical Chromatogram**

**FID**

![Typical Chromatogram](image)

- Built In Chemical and Physical Property Calculations:
  - Vapor Pressure
  - Oxygenate Content
  - Relative Density
  - Average Molecular Weight
  - Calculated Research Octane Number
  - % Carbon, % Hydrogen
  - Calculated Bromine Number
  - Mass % and Vol % Multi substituted Ring Aromatics
Simulated distillation GC analysis applies a gas chromatograph with a nonpolar column to the boiling-point distribution analysis of petroleum fractions, such as kerosene, diesel oil, lubricating oil, and heavy oil. The Shimadzu simulated distillation system, employs dedicated on cool column injector (OCI-2030) and LabSolutions simulated distillation GC analysis software, meets all applicable ASTM, ISO, EN, and JIS standards. Permitting accurate and highly reproducible analysis of high-boiling components in crude oil samples, it is the optimal system for product quality control and process management in oil refinery plants.

<table>
<thead>
<tr>
<th>Compliance Method</th>
<th>Carbon Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D 3710, D-7096</td>
<td>n-C3 to n-C15</td>
</tr>
<tr>
<td>JIS K 2254</td>
<td>-</td>
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<td>ASTM D-2887 (ISO3924, IP406)</td>
<td>n-C5 to n-C44</td>
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<tr>
<td>ASTM D-6417</td>
<td>n-C8 to n-C60</td>
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<tr>
<td>ASTM D-7213 (Extended D2887)</td>
<td>n-C7 to n-C60</td>
</tr>
<tr>
<td>ASTM D-6352</td>
<td>n-C10 to n-C90</td>
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<tr>
<td>ASTM D-7500</td>
<td>n-C7 to n-C100</td>
</tr>
<tr>
<td>EN 15199-1 (IP480, DIN)</td>
<td>n-C7 to n-C120</td>
</tr>
<tr>
<td>ASTM D-5307</td>
<td>n-C44 Max</td>
</tr>
<tr>
<td>ASTM D-7169, EN 15199-2 (IP 507)</td>
<td>n-C7 to n-C100</td>
</tr>
</tbody>
</table>
Simulated Distillation Analyzer
Nexis GC-2030SDA

Analyzer Description

System Configuration:
- 1 column (capillary) / OCI-PTV injector / FID

Sample Information:
- Base stock, lube oil, crude oil, petroleum distillate fractions (naphtha, gasoline, diesel, jet fuel, kerosene)

Compounds Analysed:
- Hydrocarbons from n-C3 to n-C120

Typical Concentration Range:
- 0.1 %

Typical Chromatogram

Chromatogram of Calibration Mix Standard

Sample Analysis of ASTM-D2887 Light Oil (Distillation Curve and Chromatogram)

Features
- Complies to method ASTM D-3710, JIS K 2254, D-2887, D-5307, D-6417, D-7213 (Extended D2887), D-6352, D-7169, D-7500, EN 15199-1
- 7-steps temperature programmable vaporization injector
- High performance column designed and suited for SIMDIST
- SIMDIST software integrated with LabSolutions
- Easy operation with multi-reporting option
Permanent gases such as oxygen, nitrogen, and carbon dioxide are contained in air. Those are utilized in various kinds of manufacturing for such as refinery, fuel cell, fertilizer, etc. In recycling blast furnace gas in steel field, gas chromatograph is useful for monitoring the gas composition. Shimadzu can offer various kinds of permanent gases analyzers. He, H₂, O₂, N₂, CO, CO₂, CH₄ and C₂ can be analyzed simultaneously with a single system.
Permanent Gases Analyzer - CO / CO₂

Nexis GC-2030PCC1

Analyzer Description

**System Configuration:**
- 2 valves / 4 columns (packed) / TCD

**Sample Information:**
- Permanent gases

**Compounds Analyzed:**
- Permanent gases (O₂, N₂, CH₄, CO and CO₂)

**Typical Concentration Range:**
- 0.01 % (O₂, N₂), 0.01 % (CO₂, CO), 0.01 % (CH₄)

**Features**
- Single channel TCD with rugged packed columns
- Backflush of water and C₂ + heavier hydrocarbons
- Configured for analysis of various gas mixture with similar composition
- 10 mins analysis time

**Typical Chromatogram**

![Typical Chromatogram](image)
Permanent Gas Analyzer - O₂ / CO / Ar
Nexis GC-2030PNC

Analyzer Description

System Configuration:
- 3 valves / 5 columns (packed) / 2 TCDs

Sample Information:
- Permanent gases

Compounds Analysed:
- Permanent gases (Ar, O₂, N₂, CH₄ and CO)

Typical Concentration Range:
- 0.05 % (Ar+O₂), 0.05 % (N₂), 0.05 % (O₂, CO), 0.05 % (CH₄)

Features
- Dual channel TCDs with rugged packed columns
- Backflush of water and C2 + heavier hydrocarbons
- Configured for analysis of various gas mixture with similar composition
- Independent channel for O₂ analysis
- 30 mins analysis time

Typical Chromatogram

TCD-1

TCD-2
Permanent Gas Analyzer
Nexis GC-2030PGAS1

Analyzer Description

System Configuration:
- 2 valves / 4 columns (packed) / 2 TCDs

Sample Information:
- Permanent gases

Compounds Analyzed:
- Permanent gases (He, H2 and Ar / O2, N2, CH4 and CO)

Typical Concentration Range:
- 0.005 % (He, H2 and Ar), 0.005 % (O2), 0.005 % (N2)

Features
- Dual channel TCDs with packed and capillary columns
- Backflush of water and C2 + heavier hydrocarbons
- Configured for analysis of various gas mixture with similar composition
- Dedicated channel for He and H2 analysis
- 10 mins analysis time

Typical Chromatogram

TCD-1

```
\begin{align*}
\text{TCD-1} & \quad \text{uV (x1,000)} \\
1 & \quad \text{He} \\
2 & \quad \text{H2} \\
3 & \quad \text{O2} \\
4 & \quad \text{N2} \\
5 & \quad \text{CH4} \\
6 & \quad \text{CO} \\
\end{align*}
```

TCD-2

```
\begin{align*}
\text{TCD-2} & \quad \text{uV (x1,000)} \\
1 & \quad \text{O2} \\
2 & \quad \text{N2} \\
3 & \quad \text{CH4} \\
4 & \quad \text{CO} \\
\end{align*}
```
Town Gas

Ensure Your Product Quality Meets the Strict Standard

Municipal gas is widely used for power generation for industrial and household. Monitoring of calorific values is important for stable supply of municipal gas.

Composition of municipal gases varies, depends on their generation source. Typical municipal gas contains C2 to C3 hydrocarbons \((\text{C}_2\text{H}_6, \text{C}_2\text{H}_4, \text{C}_2\text{H}_2, \text{C}_3\text{H}_8)\) and \(\text{O}_2, \text{N}_2, \text{CO}, \text{CO}_2, \text{H}_2\) as well as other contaminants like hydrogen sulphide may also present.

Shimadzu town gas analyzers are provided with dedicated calorific calculation software to calculate and generate the heating value report. Each GC is configured for analyzing permanent gases \((\text{O}_2, \text{N}_2, \text{CO}, \text{CO}_2, \text{H}_2)\) and hydrocarbons content \((\text{C}2, \text{C}3)\) in municipal gases.
Town Gas Analyzer
Nexis GC-2030TGA1 with Hydrogen / Nexis GC-2030TGA2 without Hydrogen

Analyzer Description

System Configuration:
- 3 valves / 6 columns (packed) / 2 TCDs

Sample Information:
- Municipal gas or similar gaseous mixture

Compounds Analysed:
- He, H₂, O₂, N₂, CO, CO₂, C₂H₆, C₂H₄, C₂H₂, C₃H₈

Typical Concentration Range:
- 0.01 % mol for permanent gases (He, H₂, O₂, N₂, CH₄, CO, CO₂) and C₂ to C₃ hydrocarbons

Reference Method:
- ASTM D-1946

Features
- Dual TCD channels
- Dedicated channel for Helium and Hydrogen
- Rugged packed columns
- 20 mins analysis time
- Optional BTU Calorific and Specific Gravity Calculation Software

Typical Chromatogram

TCD-1

TCD-2
Simple Town Gas Analyzer
Nexis GC-2030TGA3

Analyzer Description

System Configuration:
- 2 valves / 4 columns (packed) / TCD

Sample Information:
- Municipal gas or similar gaseous mixture

Compounds Analysed:
- H₂, O₂, N₂, CO, CO₂, C₂H₆, C₂H₄, C₂H₂

Typical Concentration Range:
- 0.01 % mol for permanent gases (H₂, O₂, N₂, CH₄, CO, CO₂) and C₂ hydrocarbons

Reference Method:
- ASTM D-1946

Features
- Single TCD channel
- Rugged packed columns
- 16 mins analysis time
- Optional BTU Calorific and Specific Gravity Calculation Software

Typical Chromatogram
Increase of fossil fuels consumption contribute to increase of greenhouse gases: mainly CO₂, CH₄ and N₂O in our atmosphere that traps heat and affects Earth’s temperature.
Continuous monitoring of these GHG concentrations helps to track the greenhouse gases emission trend and aids in the fight against climate change. Concentration of main compounds of GHGs is significantly different depending on exhausting source. Shimadzu offers the best concentration range solution for each monitoring source with combination of multiple detectors such as FID, TCD, ECD and BID.
Greenhouse Gases Analyzer - N\textsubscript{2}O
Nexis GC-2030N\textsubscript{2}O1

Analyzer Description

**System Configuration:**
- 2 valves / 3 columns (Capillary) / ECD

**Sample Information:**
- Greenhouse gases and soil gases

**Compounds Analysed:**
- N\textsubscript{2}O

**Typical Concentration Range:**
- 50ppb N\textsubscript{2}O

**Features**
- Single channel with high sensitive ECD detector for ppb level
- Easily expand to include SF\textsubscript{6}
- 9 mins analysis time

Typical Chromatogram

![Typical Chromatogram](image_url)
Greenhouse Gases Analyzer - N\textsubscript{2}O / CH\textsubscript{4} / CO\textsubscript{2}

Nexis GC-2030N\textsubscript{2}OCC1

**Analyzer Description**

**System Configuration:**
- 4 valves / 7 columns (packed and capillary) / ECD / TCD / FID

**Sample Information:**
- Greenhouse gases and soil gases

**Compounds Analysed:**
- N\textsubscript{2}O, CO\textsubscript{2}, CH\textsubscript{4}

**Typical Concentration Range:**
- 50 ppb N\textsubscript{2}O, 1 ppm CH\textsubscript{4}, 100 ppm CO\textsubscript{2}

**Features**
- Dual channel with high sensitive ECD detector for N\textsubscript{2}O ppb level, CH\textsubscript{4} and CO\textsubscript{2} for TCD and FID at ppm level.
- Easily expand to include SF6
- 9 mins analysis time

**Typical Chromatogram**

**ECD**

**TCD**

**FID**
Greenhouse Gases Analyzer - N\textsubscript{2}O / CH\textsubscript{4} / CO\textsubscript{2} / CO

Nexis GC-2030N\textsubscript{2}OCCC1

Analyzer Description

System Configuration:
- 5 valves / 7 columns (packed and capillary) / ECD / TCD / methanizer FID

Sample Information:
- Greenhouse gases and soil gases

Compounds Analyzed:
- N\textsubscript{2}O, CO\textsubscript{2}, CH\textsubscript{4}, CO, O\textsubscript{2}, N\textsubscript{2}

Typical Concentration Range:
- 50 ppb N\textsubscript{2}O, 1 ppm CH\textsubscript{4}, 1 ppm CO\textsubscript{2}, 1 ppm CO, 0.01 % CO\textsubscript{2}, 0.01 % CO, 0.01 % CH\textsubscript{4}, 0.01 % O\textsubscript{2}, 0.01 % N\textsubscript{2}

Features
- Dual channel with high sensitive ECD detector for N\textsubscript{2}O ppb level, O\textsubscript{2}, N\textsubscript{2}, CH\textsubscript{4}, CO and CO\textsubscript{2} for TCD at % level and CH\textsubscript{4}, CO and CO\textsubscript{2} for methanizer FID at ppm level.
- Easily expand to include SF6
- 11 mins analysis time

Typical Chromatogram

- **ECD**
  - uV(x1,000)
  - 1: N\textsubscript{2}O (5.0 ppm)

- **TCD-1**
  - uV(x1,000)
  - 1: O\textsubscript{2} (1.01 %)
  - 2: N\textsubscript{2} (0.99 %)
  - 3: CH\textsubscript{4} (75.2 %)
  - 4: CO (1 %)
  - 5: CO\textsubscript{2} (1 %)

- **FID**
  - uV(x1,000)
  - 1: CH\textsubscript{4} (5.1 ppm)
  - 2: CO (4.8 ppm)
  - 3: CO\textsubscript{2} (4.9 ppm)
When oil-type transformer has malfunction, degradation of oil inside the transformer by heating or arc-discharge. This gas solves into the oil. The malfunction can be determined by extracting and analyzing the gas. Shimadzu offers both of System GC compliant with ASTM D-3612 Method B (oil stripper sampling) and ASTM D-3612 Method C (headspace sampling).
Transformer Oil Gas Analyzer - D3612 Method B
(Oil Stripper Column)

Nexis GC-2030TOGAS1

Analyzer Description

System Configuration:
- 2 valves / 6 columns (packed) / Oil Stripper / methanizer FID / TCD

Sample Information:
- Transformer oil

Compounds Analysed:
- H₂, O₂, N₂, CO₂, CH₄, CO, C₂H₂, C₂H₆, and C₃H₂

Typical Concentration Range:
- 20 ppm for H₂, 500 ppm for O₂, 500 ppm for N₂, 1 ppm for CH₄,
  2 ppm for CO and CO₂, 1 ppm for C₂ hydrocarbons (C₂H₂, C₂H₆, C₂H₄).

Reference Method:
- ASTM D-3612 Method B

Features

- Trace levels of CO and CO₂ can be converted to CH₄ for FID detection
- Direct oil sample injection through oil stripper.
- 17 mins analysis time

Typical Chromatogram

FID

TCD

1: H₂ (101 ppm)
2: O₂ (2.991 ppm)
3: N₂ (1.4 %)
1: C₂H₂ (106 ppm)
2: CO (107 ppm)
3: CO₂ (398 ppm)
4: C₂H₂ (97 ppm)
5: C₂H₂ (99 ppm)
6: C₂H₂ (97 ppm)
Transformer Oil Gas Analyzer - D3612 Method C (Headspace Sampling)

Nexis GC-2030TOGAS2

Analyzer Description

System Configuration:
・ 2 valves / 3 columns (packed) / Packed injector for Headspace option / methanizer FID / TCD

Sample Information:
・ Transformer oil

Compounds Analysed:
・ H₂, O₂, N₂, CO₂, CH₄, CO, C₂H₆, C₂H₄ and C₃H₂

Typical Concentration Range:
・ 2.5 ppm for H₂, 50ppm for O₂, 50 ppm for N₂, 1 ppm for CH₄, CO, CO₂ and C₂ hydrocarbons (C₂H₆, C₂H₄, C₃H₂).

Reference Method:
・ ASTM D-3612 Method C

Features

・ Trace levels of CO and CO₂ can be converted to CH₄ for FID detection
・ Manual sampling with Headspace option
・ 17 mins analysis time

Typical Chromatogram

FID

TCD
Transformer Oil Gas Analyzer - D3612 Method C
Nexis GC-2030TOGAS3

Analyzer Description

System Configuration:
- 3 valves / 3 columns (packed) / Packed injector for Headspace option / methanizer FID / TCD / PDHID

Sample Information:
- Transformer Oil

Compounds Analysed:
- H₂, O₂, N₂, CO₂, CH₄, CO, C₂H₆, C₂H₄, C₂H₂, C₃H₆, C₃H₈ and i-C₄H₁₀

Typical Concentration Range:
- 0.1 ppm for H₂, 50 ppm for O₂, 50 ppm for N₂, 0.1 ppm for CH₄ and CO, 1 ppm for CO₂, 0.1 ppm for C₂ hydrocarbons (C₂H₆, C₂H₄, C₂H₂), 0.2 ppm for C₃ hydrocarbons (C₃H₈, C₃H₆) and 1 ppm for i-C₄H₁₀.

Reference Method:
- ASTM D-3612 Method C

Features

- Trace levels of H₂, CH₄ and CO detect by PDHID
- Trace levels of CO and CO₂ can be converted to CH₄ for FID detection
- Detection of hydrocarbons from C₂ to C₄ on FID.
- Manual sampling with Headspace option
- 20 mins analysis time

Typical Chromatogram

PDHID

TCD

FID
## Natural Gas

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030NGA1</td>
<td>Natural Gas Analyzer with He/H₂ Analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030NGA2</td>
<td>Natural Gas Analyzer without He/H₂ Analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030FNGA1</td>
<td>Fast Natural Gas Analyzer with He/H₂ Analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030FNGA2</td>
<td>Fast Natural Gas Analyzer without He/H₂ Analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030ENGA1</td>
<td>Extended Natural Gas Analyzer (Single Oven)</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030ENGA2</td>
<td>Extended Natural Gas Analyzer (Dual Oven)</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030ISO6974-3</td>
<td>Natural Gas Analyzer (ISO6974-3)</td>
<td>ISO6974-3</td>
</tr>
<tr>
<td>Nexis GC-2030ISO6974-4</td>
<td>Natural Gas Analyzer (ISO6974-4)</td>
<td>ISO6974-4</td>
</tr>
<tr>
<td>Nexis GC-2030 BIDUFNGA</td>
<td>BID Ultra-Fast Natural Gas Analyzer</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
</tbody>
</table>

## Refinery Gas

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030FRGA1</td>
<td>Refinery Gas Analyzer with He/H₂ Analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030FRGA2</td>
<td>Refinery Gas Analyzer without He/H₂ analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030HSRGA1</td>
<td>High-Speed RGA with He/H₂ analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030HSRGA2</td>
<td>High-Speed RGA without He/H₂ analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030ERGA1</td>
<td>Extended Refinery Gas Analyzer with He/H₂ analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030ERGA2</td>
<td>Extended Refinery Gas Analyzer without He/H₂ analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030CERGA1</td>
<td>Complete Extended Refinery Gas Analyzer</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030 BIDUFRA</td>
<td>BID Ultra-Fast RGA with BID-2010 analysis</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030 BIDERGA-S</td>
<td>BID Extended RGA with BID-2010 analysis (Single Oven)</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
</tr>
<tr>
<td>Nexis GC-2030 BIDERGA-D</td>
<td>BID Extended RGA with BID-2010 analysis (Dual Oven)</td>
<td>ASTM D-1945, D-3588, GPA-2261</td>
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</table>

## Liquefied Petroleum Gases

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
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</thead>
<tbody>
<tr>
<td>Nexis GC-2030LPGHC1</td>
<td>Hydrocarbons in LPG Analyzer with Vaporiser</td>
<td>ASTM D-2163</td>
</tr>
<tr>
<td>Nexis GC-2030LPGHC2</td>
<td>Hydrocarbons in LPG Analyzer with Liquid Sampling Valve</td>
<td>ASTM D-2163</td>
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</tbody>
</table>
## Analyzer BY REFERENCE

### Trace Gases

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030CCC1</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>UOP 603</td>
</tr>
<tr>
<td>Nexis GC-2030CCC2</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>UOP 603</td>
</tr>
<tr>
<td>Nexis GC-2030CCC3</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>UOP 603</td>
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<tr>
<td>Nexis GC-2030CCC4</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>UOP 603</td>
</tr>
<tr>
<td>Nexis GC-2030CCC5</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>ASTM D-2504</td>
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<tr>
<td>Nexis GC-2030TCC</td>
<td>Trace gases analyzer - CO₂, CO and CH₄</td>
<td>ASTM D-2504</td>
</tr>
<tr>
<td>Nexis GC-2030TH2</td>
<td>Trace H₂ Analyzer</td>
<td>ASTM D-2504</td>
</tr>
<tr>
<td>Nexis GC-2030TNO</td>
<td>Trace O₂/N₂ Analyzer</td>
<td>ASTM D-2504</td>
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<tr>
<td>Nexis GC-2030HC2</td>
<td>Methane Purity Analyzer</td>
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### Trace Sulfur

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<thead>
<tr>
<th>Model</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Nexis GC-2030SUL1</td>
<td>Trace Sulphur Analyzer</td>
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### Reformulated Fuel

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
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</thead>
<tbody>
<tr>
<td>Nexis GC-2030BTA1</td>
<td>Reformulated Fuel Analyzer - BT</td>
<td>ASTM D-3606</td>
</tr>
<tr>
<td>Nexis GC-2030FBTA1</td>
<td>Reformulated Fuel Analyzer - BT</td>
<td>ASTM D-3606</td>
</tr>
<tr>
<td>Nexis GC-2030ACA1</td>
<td>Reformulated Fuel Analyzer - Aromatics</td>
<td>ASTM D-5580</td>
</tr>
<tr>
<td>Nexis GC-2030OAS</td>
<td>Reformulated Fuel Analyzer - Oxygenates</td>
<td>ASTM D-4815</td>
</tr>
<tr>
<td>Nexis GC-2030OAS3</td>
<td>Reformulated Fuel Analyzer - Oxygenates</td>
<td>UOP 960</td>
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</table>

### Detailed Hydrocarbons Analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
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</thead>
</table>
## Simulated Distillation

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Configured per Published Method</th>
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</thead>
<tbody>
<tr>
<td>Nexis GC-2030SDA</td>
<td>Simulated Distillation Analyzer</td>
<td>ASTM D-2887, D-3710, D-5307, D-6417, D-7213, D-6352, D-7169, D-7500, D-7096, EN 15199-1, JIS K 2254</td>
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</table>

## Permanent Gases

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030PCC1</td>
<td>Permanent Gases Analyzer - CO / CO₂</td>
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</tr>
<tr>
<td>Nexis GC-2030PNC</td>
<td>Permanent Gas Analyzer - O₂ / CO / Ar</td>
<td></td>
</tr>
<tr>
<td>Nexis GC-2030PGAS1</td>
<td>Permanent Gas Analyzer</td>
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</tr>
</tbody>
</table>

## Town Gas

<table>
<thead>
<tr>
<th>Model</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030TGA1</td>
<td>Town Gas Analyzer with He / H₂ analysis</td>
<td>ASTM D-1946</td>
</tr>
<tr>
<td>Nexis GC-2030TGA2</td>
<td>Town Gas Analyzer without He / H₂ analysis</td>
<td>ASTM D-1946</td>
</tr>
<tr>
<td>Nexis GC-2030TGA3</td>
<td>Simple Town Gas Analyzer</td>
<td>ASTM D-1946</td>
</tr>
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</table>

## Greenhouse Gases

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Nexis GC-2030N₂O1</td>
<td>Greenhouse Gases Analyzer - N₂O</td>
<td></td>
</tr>
<tr>
<td>Nexis GC-2030N₂OCC1</td>
<td>Greenhouse Gases Analyzer - N₂O / CH₄ / CO₂</td>
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</tr>
<tr>
<td>Nexis GC-2030N₂OCCC1</td>
<td>Greenhouse Gases Analyzer - N₂O / CH₄ / CO₂ / CO</td>
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</table>

## Transformer Oil Gas

<table>
<thead>
<tr>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>Nexis GC-2030TOGAS1</td>
<td>Transformer Oil Gas Analyzer - D3612 Method B (Oil Stripper Column)</td>
<td>ASTM D-3612 B method</td>
</tr>
<tr>
<td>Nexis GC-2030TOGAS2</td>
<td>Transformer Oil Gas Analyzer - D3612 Method C (Headspace Sampling)</td>
<td>ASTM D-3612 C method</td>
</tr>
</tbody>
</table>
For More Information:

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