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C10G-E064

# System Gas Chromatography (GC)
## Data Sheets

# Shimadzu's System GC Solutions

Shimadzu provides proven System GC Solutions designed to meet the demands of your business and industry. Our System GC Analyzers are built and tested to meet the specific analysis requirements of applicable industry standards.

## What are you looking for?

- Refinery Gas Analysis
  $H_2$, He, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1 to C18, etc.
- Ultra-fast Refinery Gas Analysis
  $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6-C13, etc.
- Natural Gas Analysis
  $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6-C13, etc.
- LPG Analysis System Lineup
  C1-C6, etc.
- Gasoline / Fuel Analysis
  Benzene, toluene, aromatics, oxygenates, etc.
- Detailed Hydrocarbon Analysis
  Naphtha
- Transformer Oil Gas Analysis
  $H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, $C_2$
- Town Gas Analysis
  $H_2$, $O_2$, $N_2$, CO, $CO_2$, C1, C2, C3
- Trace Sulfur Analysis
  $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides, thiophene in benzene
- Green House Gas Analysis
  $N_2O$, $O_2$, $N_2$, CO, $CO_2$, $CH_4$
- Downstream and Others

# Refinery Gas Solution

Gas compositions produced in refinery plants consist of hydrocarbons, permanent gases, $H_2S$, etc. Analyzing these gases is essential to control the quality of chemical products and plant operation. Shimadzu's RGA systems, available in numerous configurations, are designed to analyze various compositions in a variety of processes. In research and development for petrochemical and its catalysis field, target compounds often contain high-boiling point compounds and isomers. The Shimadzu CERGA makes it possible to precisely analyze those samples. In addition, calorific value calculation software is compliant with various calculation methods such as BTU and ISO-6976. The ultrafast analysis system Ultra-Fast RGA (UFRGA) series is also available

| **RGA series lineup** | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D2504 | $H_2$ | TCD | 5 minutes | **No. 63** |
| ASTM-D2504 | $O_2$, $N_2$ | TCD | 5 minutes | **No. 64** |
| ASTM-D2504 | CO, $CO_2$, $CH_4$ | FID with Methanizer | 20 minutes | **No. 65** |
| ASTM-D1945 | $H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, $C_2H_4$, $C_2H_6$, $C_2H_2$ | TCDx2 | 10 minutes | **No. 66** |
| ASTM-D2163 | $H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, C1-C5, C6+ | TCDx3 | 30 minutes | **No. 67** |
| ASTM-D2163 | $H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, C1-C5 , C6+ | TCDx3 | 40 minutes | **No. 79** |
| **RGA series lineup (High-speed analysis type)** | | | | |
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D1945, D1946, D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCDx2, FID | 10 minutes | **No. 7** |
| ASTM-D1945, D1946, D3588, GPA-2261 | $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCD, FID | 10 minutes | **No. 8** |
| ASTM-D1945, D1946, D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCDx2, FID | 10 minutes | **No. 120** |
| ASTM-D1945, D1946, D3588, GPA-2261 | $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCD, FID | 10 minutes | **No. 121** |
| ASTM-D1945, D1946, D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCDx2, FID | 6 minutes | **No. 43** |
| ASTM-D1945, D1946, D3588, GPA-2261 | $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+ (backflush) | TCD, FID | 6 minutes | **No. 44** |
| **RGA series lineup (Extended type)** | | | | |
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D1945, D1946, D3588, GPA-2261 | $H_2$, He, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1 to C18 | TCDx2, FIDx2 | 25 minutes | **No. 45** |
| ASTM-D1945, D1946, D3588, GPA-2261 | $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1 to C18 | TCD, FIDx2 | 25 minutes | **No. 46** |

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Application Data Sheet

No.63

# System Gas Chromatograph

# Trace $H_2$ Analysis System
# Nexis GC-2030TH2
# GC-2014TH2

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The system enables a quantitative and qualitative analysis of H2 in municipal gas. A total of 1 valve and 2 columns are used in this GC system. N2 is used as the carrier gas. Sample is introduced into one sample loop for determination. Using a pre-column, C2-C3 components are back-flushed. The valve timing then allows O2 and N2 to directed to molecular sieve column for separation and TCD for detection. The analysis time is approximately 4 minutes. LabSolutions chromatography workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
One valve / Two packed columns with one TCD detector

**Sample Information:**
$H_2$

**Methods met:**
ASTM-D2504

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 5ppm | 500ppm | TCD-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 5 minutes analysis for H2 analysis can be carried out
- Single TCD channel
- Good repeatability

## Typical Chromatograms

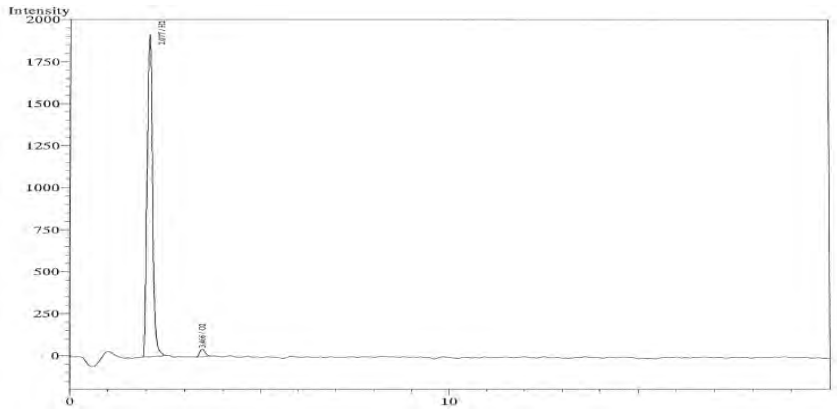


Fig. Chromatogram of TCD

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No.64

# System Gas Chromatograph

# Trace $O_2$ and $N_2$ Analysis System Nexis GC-2030TNO GC-2014TNO

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The system enables a quantitative and qualitative analysis of H2. A total of 1 valve and 2 columns are applied in this GC system. Helium is used as carrier gas. Sample is introduced into one sample loop for determination. Using a pre-column, C2-C3 components are back-flushed. The valve timing allows O2 and N2 to introduce to molecular sieve column for separation and then detected by TCD. Analysis time is approximately 4 minutes. LabSolution workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
One valve / Two packed columns with one TCD detector

**Sample Information:**
$O_2$ , $N_2$

**Methods met:**
ASTM-D2504

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | O2 | 5ppm | 500ppm | TCD-1 |
| 2 | N2 | 5ppm | 500ppm | TCD-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 5 minutes analysis for O2 and N2 analysis can be carried out
- TCD channel
- Good repeatability

## Typical Chromatograms

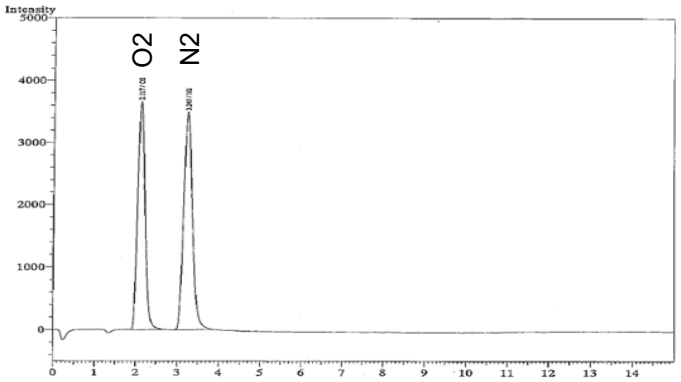


Fig. Chromatogram of TCD

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# System Gas Chromatograph

# Trace CO and $CO_2$ Analysis System Nexis GC-2030TCC GC-2014TCC

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This system is designed to measure trace amount of carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in a gas sample. The sample is loaded into a loop and injected through a 10-port valve automatically. CO and CO2 are reduced to CH4 by means of nickel catalyst and detected by flame ionization detector (FID).

## Analyzer Information

**System Configuration:**
Three valves / Five packed columns with one FID detector with MTN

**Sample Information:**
CO , $CO_2$,$CH_4$

**Methods met:**
ASTM-D2504

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CO | 0.5ppm | 100ppm | FID+MTN |
| 2 | CO2 | 0.5ppm | 100ppm | FID+MTN |
| 3 | CH4 | 0.5ppm | 2000ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 20 minutes analysis for CO,CO2 and CH4 analysis can be carried out
- FID channel
- Good repeatability

## Typical Chromatograms

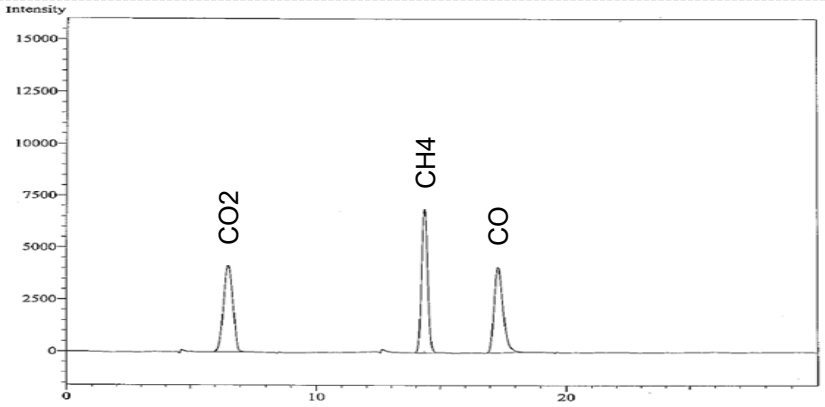


Fig. Chromatogram of FID

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System Gas Chromatograph

# Composition of $H_2$ – $C_2H_2$ Analysis Nexis GC-2030HC2 GC-2014HC2

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A simple and efficient method based on the technique of valve switching is developed for the analysis of H2, Ar, O2, CO, CH4, CO2 and C2. A total of 3 valves and 6 columns are used in this GC system. Sample is introduced into one sample loop for determination. H2 is detected by TCD-1. The other permanent gases and CH4 are directed into column-2 through Valve 2. Ar, O2, N2, CH4 and CO flow through column-3(MS-13X), are separated and detected by TCD-2. CO2 and the light hydrocarbons are directed on to a porous polymer column for separation and detected by TCD 2.

## Analyzer Information

**System Configuration:**
Three valves / six packed columns with two TCD detectors

**Sample Information:**
$H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, $C_2H_4$, $C_2H_6$, $C_2H_2$

**Methods met:**
ASTM-D1945

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.05% | 100% | TCD-1 |
| 2 | Ar+O2 | 0.05% | 30% | TCD-2 |
| 3 | N2 | 0.05% | 100% | TCD-2 |
| 4 | CH4 | 0.05% | 90% | TCD-2 |
| 5 | CO | 0.05% | 50% | TCD-2 |
| 6 | CO2 | 0.05% | 60% | TCD-2 |
| 7 | C2H6 | 0.05% | 50% | TCD-2 |
| 8 | C2H4 | 0.05% | 50% | TCD-2 |
| 9 | C2H2 | 0.05% | 10% | TCD-2 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- Dual TCD channels
- Good repeatability

## Typical Chromatograms

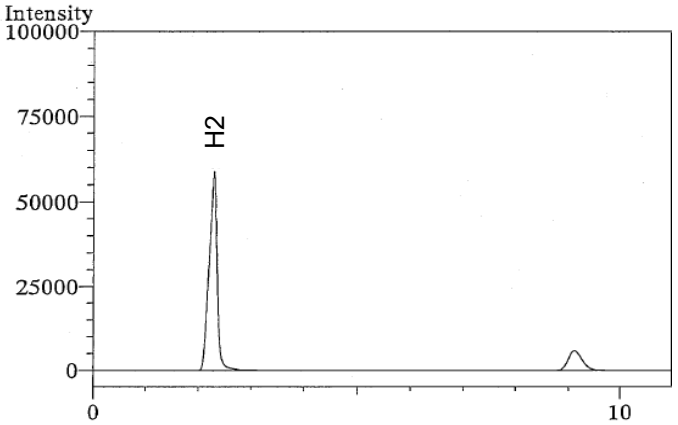


Fig. 1 Chromatogram of TCD-1

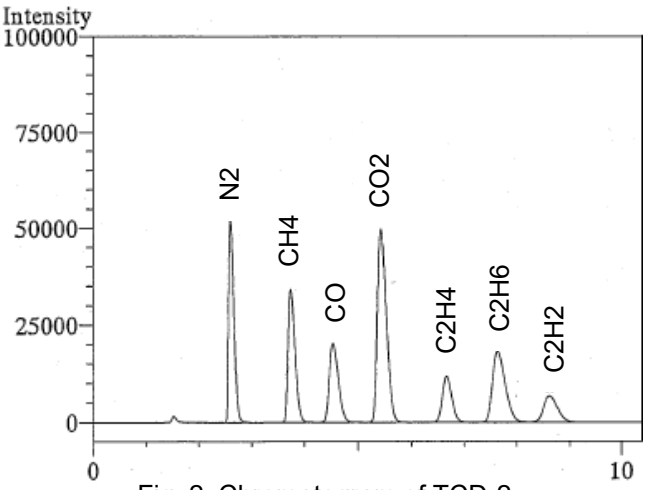


Fig. 2 Chromatogram of TCD-2

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# System Gas Chromatograph

## Wide Range of Gaseous Hydrocarbons Mixture Obtained from Refining Processes

# Nexis GC-2030RGA1
# GC-2014RGA1

Return to Table

This instrument is designed for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 4 valves and 6 columns are applied in this GC system. Sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3through to C5to be separated individually through by Shimalite-Q and Sebaconitrile columns and to be detected by TCD-3. Using an MS-13X column, O2, N2, CH4, CO are separated while CO2 and the C2 compounds are separated by Porapak-Q column and detected by TCD-1. H2 will be separated by a MS-5A column and detected by TCD-2 using N2as carrier gas. The final analysis time is approximately 30 minutes. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Four valves / nine packed columns with three TCD detectors

**Sample Information:**
$H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, $C_1$-$C_5$ , $C_{6+}$

**Methods met:**
ASTM-D2163

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.05% | 100% | TCD-2 |
| 2 | Ar+O2 | 0.05% | 100% | TCD-1 |
| 3 | N2 | 0.05% | 100% | TCD-1 |
| 4 | CH4 | 0.05% | 50% | TCD-1 |
| 5 | CO | 0.05% | 20% | TCD-1 |
| 6 | CO2 | 0.05% | 60% | TCD-1 |
| 7 | C2H6 | 0.05% | 15% | TCD-1 |
| 8 | C2H4 | 0.05% | 20% | TCD-1 |
| 9 | C3H8 | 0.05% | 50% | TCD-3 |
| 10 | C3H6 | 0.05% | 100% | TCD-3 |
| 11 | C3H8 | 0.05% | 5% | TCD-3 |
| 12 | i-C4H10 | 0.05% | 30% | TCD-3 |
| 13 | n-C4H10 | 0.05% | 30% | TCD-3 |
| 14 | trans-2-C4H8 | 0.05% | 10% | TCD-3 |
| 15 | cis-2-C4H8 | 0.05% | 10% | TCD-3 |
| 16 | 1-C4H8 | 0.05% | 10% | TCD-3 |
| 17 | i-C4H8 | 0.05% | 10% | TCD-3 |
| 18 | i-C5H12 | 0.05% | 2% | TCD-3 |
| 19 | n-C5H12 | 0.05% | 2% | TCD-3 |
| 20 | 1,3-C4H6 | 0.05% | 2% | TCD-3 |
| 21 | C6 plus | 0.05% | 10% | TCD-3 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Calorific value software is available
- 30 minutes analysis for natural gases analysis can be carried out
- Three TCD channels
- Good repeatability

## Typical Chromatograms

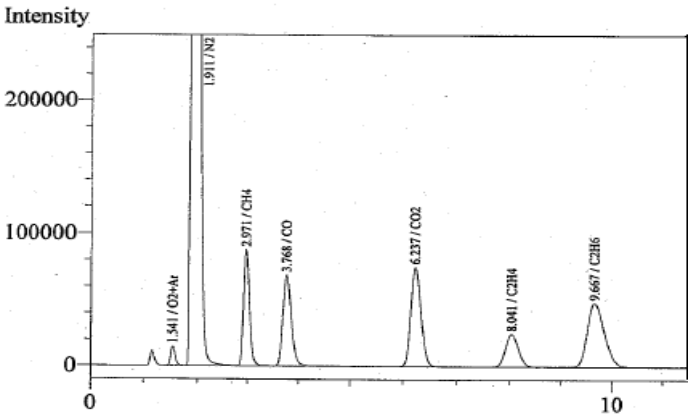


Fig. 1 Chromatogram of TCD-1

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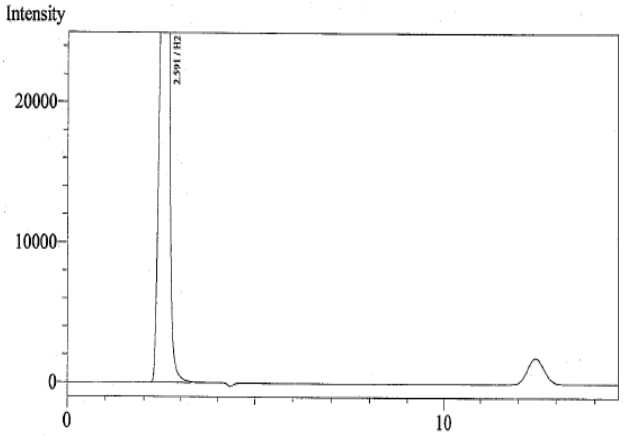


Fig. 2 Chromatogram of TCD-2

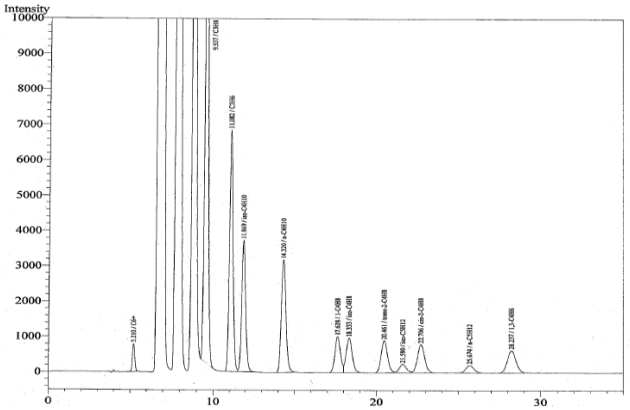


Fig. 3 Chromatogram of FID

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No. 79

# System Gas Chromatograph

## Gaseous Hydrocarbons Mixture Obtained from Refining Processes

## Nexis GC-2030RGA2
## GC-2014RGA2

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This instrument is designed to determine the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 4 valves and 6 columns are used in this GC system. Four sample loops are filled and actuate simultaneously. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated individually by Shimalite-Q and Sebaconitrile columns and detected by TCD-3. A MS-13X, which is used to separate O2, N2, CH4, CO. CO2 and the C2 compounds are separated by a Sunpak S column and detected by TCD-1. H2 will be separated by a MS-5A and detected by TCD-2 using N2 as carrier gas. The final analysis time is approximately 40 minutes. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Four valves / nine packed columns with three TCD detectors

**Sample Information:**
$H_2$, $O_2$, $N_2$, Ar, CO, $CO_2$, $C_1$-$C_5$ , $C_{6+}$

**Methods met:**
ASTM-D2163

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.05% | 100.00% | TCD-2 |
| 2 | Ar+O2 | 0.05% | 10.00% | TCD-1 |
| 3 | N2 | 0.05% | 100.00% | TCD-1 |
| 4 | CH4 | 0.05% | 50.00% | TCD-1 |
| 5 | CO | 0.05% | 20.00% | TCD-1 |
| 6 | CO2 | 0.05% | 20.00% | TCD-1 |
| 7 | C2H6 | 0.05% | 15.00% | TCD-1 |
| 8 | H2S | 0.05% | 5.00% | TCD-1 |
| 9 | C2H4 | 0.05% | 20.00% | TCD-1 |
| 10 | C3H8 | 0.05% | 50.00% | TCD-3 |
| 11 | C3H6 | 0.05% | 100.00% | TCD-3 |
| 12 | i-C4H10 | 0.05% | 30.00% | TCD-3 |
| 13 | n-C4H10 | 0.05% | 30.00% | TCD-3 |
| 14 | trans-2-C4H8 | 0.05% | 10.00% | TCD-3 |
| 15 | cis-2-C4H8 | 0.05% | 10.00% | TCD-3 |
| 16 | 1-C4H8 | 0.05% | 10.00% | TCD-3 |
| 17 | i-C4H8 | 0.05% | 10.00% | TCD-3 |
| 18 | i-C5H12 | 0.05% | 2.00% | TCD-3 |
| 19 | n-C5H12 | 0.05% | 2.00% | TCD-3 |
| 20 | 1,3-C4H6 | 0.05% | 2.00% | TCD-3 |
| 21 | C6 plus | 0.05% | 10.00% | TCD-3 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Calorific value software is available
- 40 minutes analysis for natural gases analysis can be carried out
- Three TCD channels
- Good repeatability

## Typical Chromatograms

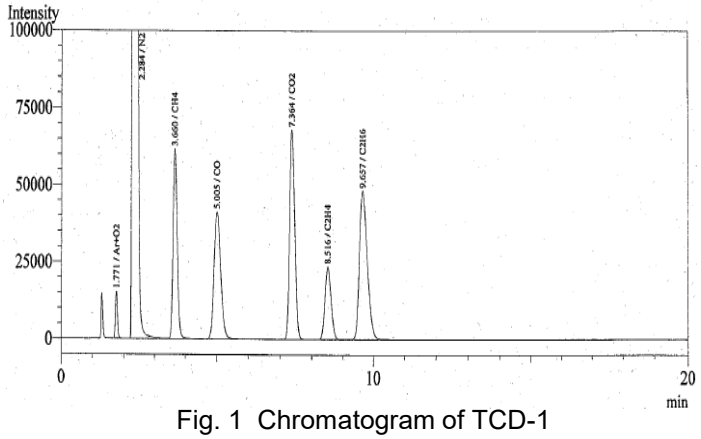


Fig. 1 Chromatogram of TCD-1

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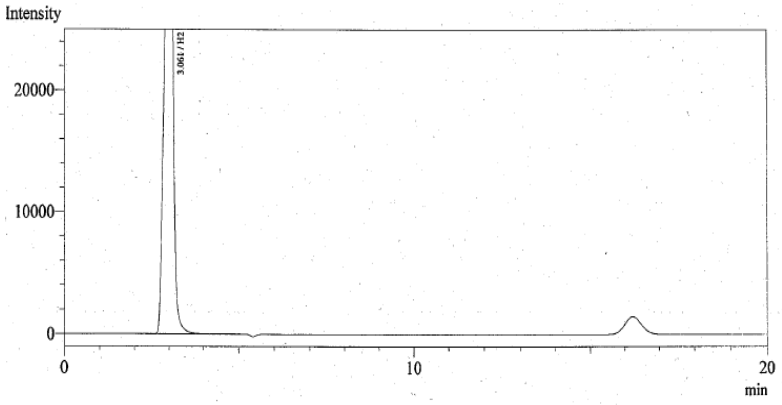


Fig. 2 Chromatogram of TCD-2

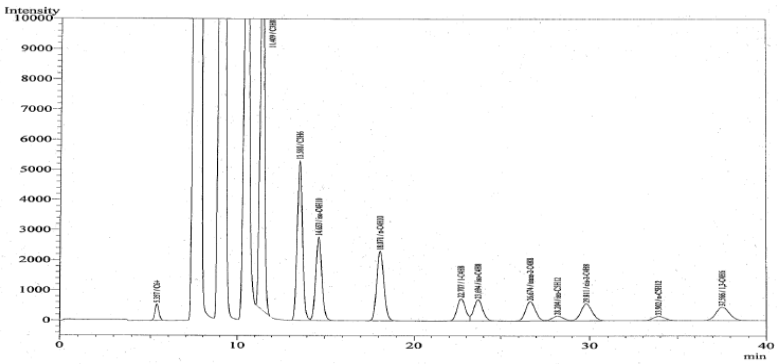


Fig. 3 Chromatogram of TCD-3

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# System Gas Chromatograph

# Fast Refinery Gas Analyzer
# Nexis GC-2030FRGA1
# GC-2014FRGA1

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This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. The system uses a total of four valves and eight columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually using an Alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. simultaneously, CO2, C2, and H2S are separated with an Rtx-Q plot column and detected by the TCD. H2 will be separated by MS-5A and, with the other components vented out, detected by another TCD using N2 as carrier gas. The final analysis time is approximately 10 minutes. The system includes Lab Solutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

### System Configuration:
Four valves / eight capillary and packed columns with two TCD / one FID detectors

### Sample Information:
He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ , $C_{6+}$

### Methods met:
ASTM-D1945, D3588, GPA-2261

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.010% | 10.0% |
| 2 | H2 | 0.010% | 10.0% |
| 3 | O2 | 0.010% | 20.0% |
| 4 | N2 | 0.010% | 50.0% |
| 5 | CH4 | 0.010% | 80.0% |
| 6 | CO | 0.010% | 5.0% |
| 7 | CO2 | 0.010% | 20.0% |
| 8 | C2H4 | 0.010% | 10.0% |
| 9 | C2H6 | 0.010% | 10.0% |
| 10 | C2H2 | 0.010% | 10.0% |
| 11 | H2S | 0.100% | 30.0% |
| 12 | C3H8 | 0.001% | 5.0% |
| 13 | C3H6 | 0.001% | 5.0% |
| 14 | i-C4H10 | 0.001% | 1.0% |
| 15 | n-C4H10 | 0.001% | 1.0% |
| 16 | Other Hydrocarbons | 0.001% | 1.0% |
| 17 | C6+ | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 10 minutes analysis for refinery gas
- Dual TCD, FID channels for simultaneous analysis
- Calorific value software is available
- Good separation for $H_2$ and He, and full range capability for $H_2$

## Typical Chromatograms

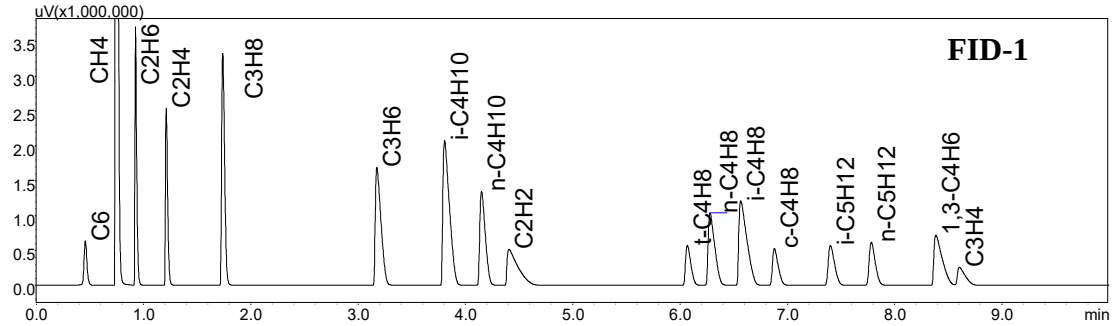


Fig. 1 Chromatogram of FID-1

Return to Table

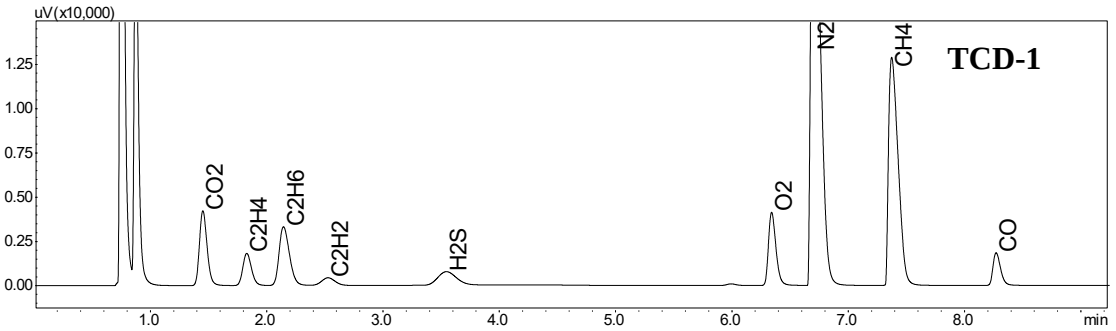


Fig. 2 Chromatogram of TCD-1

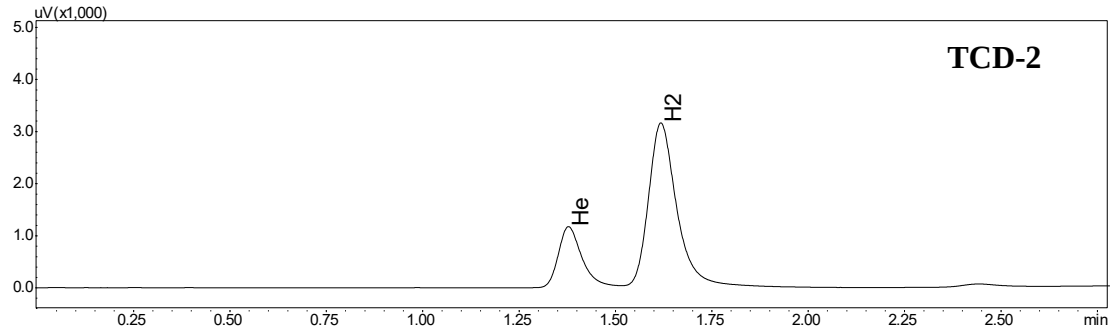


Fig. 3 Chromatogram of TCD-2

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No.8

# System Gas Chromatograph

# Fast Refinery Gas Analyzer
# Nexis GC-2030FRGA2
# GC-2014FRGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This analyzer uses a total of three valves and six columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually using an Alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. simultaneously CO2, C2, and H2S are separated with an Rtx-Q plot column and detected by the TCD. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Three valves / six capillary and packed columns with TCD / FID detectors

**Sample Information:**
$O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ , $C_{6+}$

**Detection Limits:**
The lowest level of quantification for the permanent gases is 50ppm, $H_2S$ 500ppm by TCD and hydrocarbons is 10ppm by FID with Helium carrier gas

**Methods met:**
ASTM-D1945, D1946, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.010% | 20.0% |
| 2 | N2 | 0.010% | 50.0% |
| 3 | CH4 | 0.010% | 80.0% |
| 4 | CO | 0.010% | 5.0% |
| 5 | CO2 | 0.010% | 20.0% |
| 6 | C2H4 | 0.010% | 10.0% |
| 7 | C2H6 | 0.010% | 10.0% |
| 8 | C2H2 | 0.010% | 10.0% |
| 9 | H2S | 0.100% | 30.0% |
| 10 | C3H8 | 0.001% | 5.0% |
| 11 | C3H6 | 0.001% | 5.0% |
| 12 | i-C4H10 | 0.001% | 1.0% |
| 13 | n-C4H10 | 0.001% | 1.0% |
| 14 | Propadiene(C3H4) | 0.001% | 1.0% |
| 15 | Other Hydrocarbons | 0.001% | 0.5% |
| 16 | C6+ | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 10 minutes analysis for refinery gas
- TCD with FID channels for simultaneous analysis
- Calorific value software is available
- Water should be removed from sample if $H_2S$ analysis is required

## Typical Chromatograms

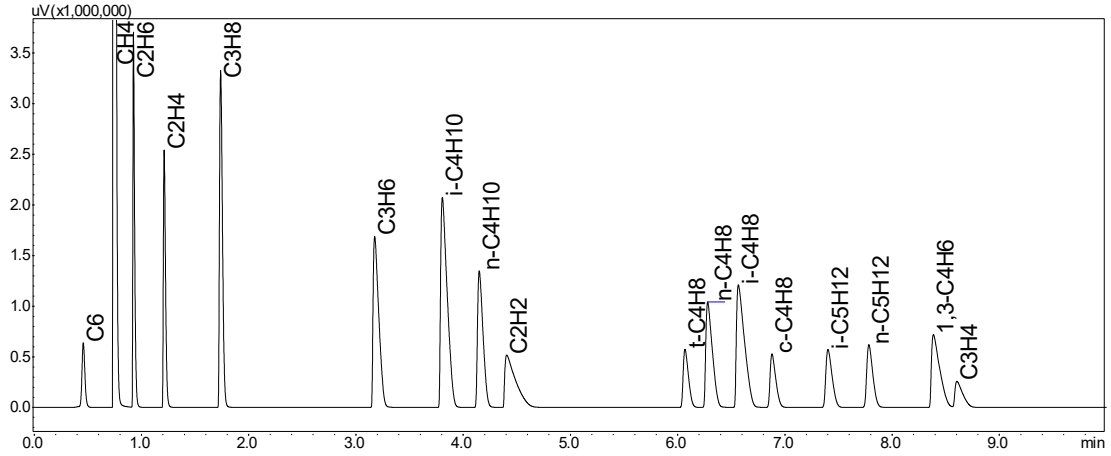


Fig. 1 Chromatogram of FID-1

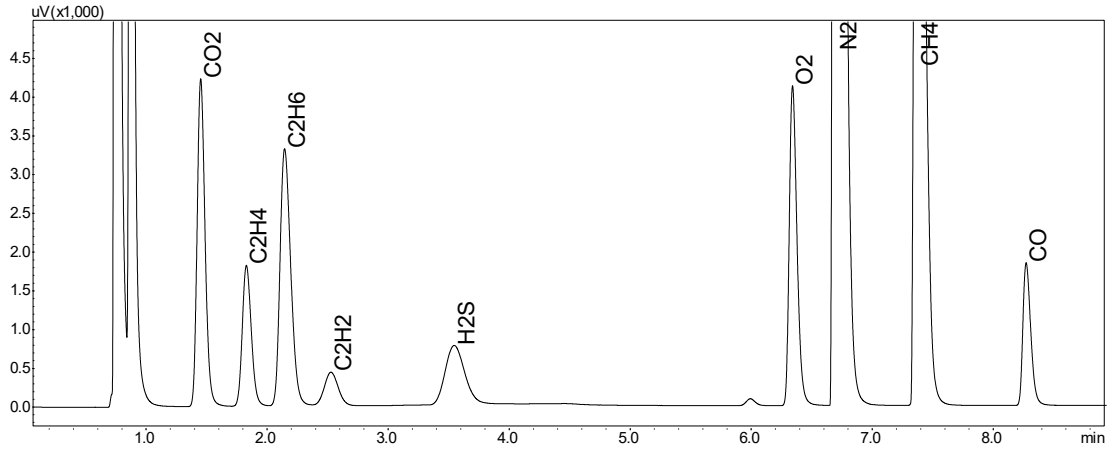


Fig. 2 Chromatogram of TCD

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No.120

# System Gas Chromatograph

# Fast NGA System with He/H2 Analysis
# Nexis GC-2030 FRGA-II1
# GC-2014 FRGA-II1

Return to Table

This GC system is designed for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 5 valves and 8 columns are used in this GC system. Sample is loaded into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated by an Alumina capillary column and to be detected by FID. Using a P-N column , Air+CO+CH4 elute as a mixed peak to packed column MS-5A, then separated, switching the valve, CO2, C2, H2S elute to a P-Q column then separated. These components are detected by TCD. H2 will be separated by an MS-5A. The other components are vented out and detected by another TCD using N2 as carrier gas. The final analysis time is approximately 10 minutes. The system includes Lab Solutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Five valves / seven packed column and one capillary with two TCD detectors and one FID detector

**Sample Information:**
Permanent gas ,C1-C6

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | He | 0.010% | 10.0% | TCD-2 |
| 2 | H2 | 0.010% | 10.0% | TCD-2 |
| 3 | O2 | 0.010% | 20.0% | TCD-1 |
| 4 | N2 | 0.010% | 50.0% | TCD-1 |
| 5 | CH4 | 0.010% | 80.0% | TCD-1 |
| 6 | CO | 0.010% | 5.0% | TCD-1 |
| 7 | CO2 | 0.010% | 20.0% | TCD-1 |
| 8 | C2H4 | 0.010% | 10.0% | TCD-1 |
| 9 | C2H6 | 0.010% | 10.0% | TCD-1 |
| 10 | C2H2 | 0.010% | 10.0% | TCD-1 |
| 11 | H2S | 0.100% | 30.0% | TCD-1 |
| 12 | C3H8 | 0.001% | 5.0% | FID |
| 13 | C3H6 | 0.001% | 5.0% | FID |
| 14 | i-C4H10 | 0.001% | 1.0% | FID |
| 15 | n-C4H10 | 0.001% | 1.0% | FID |
| 16 | Propadiene(C3H4) | 0.001% | 1.0% | FID |
| 17 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 18 | 1-C4H8 | 0.001% | 0.5% | FID |
| 19 | i-C4H8 | 0.001% | 0.5% | FID |
| 20 | Cis-2-C4H8 | 0.001% | 0.5% | FID |
| 21 | i-C5H12 | 0.001% | 0.5% | FID |
| 22 | n-C5H12 | 0.001% | 0.5% | FID |
| 23 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 24 | C3H4 | 0.001% | 0.5% | FID |
| 25 | C6+ | 0.001% | 1.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Two TCD channels and one FID channels
- Calorific value software is available
- Good repeatability

## Typical Chromatograms

Return to Table

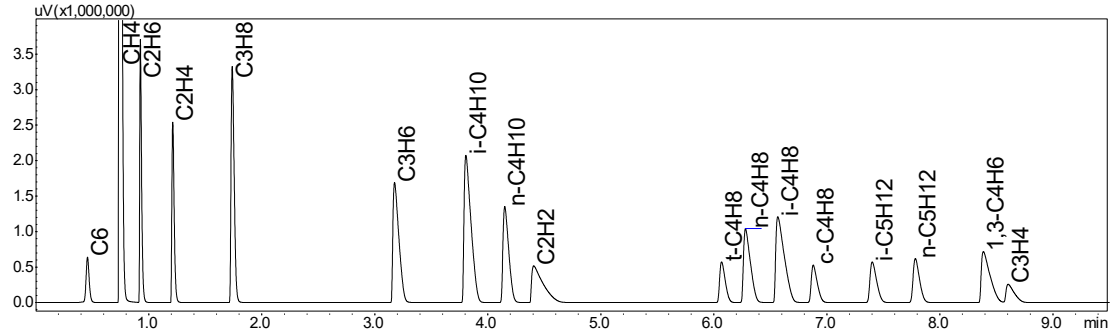


Fig.1 Chromatogram of FID

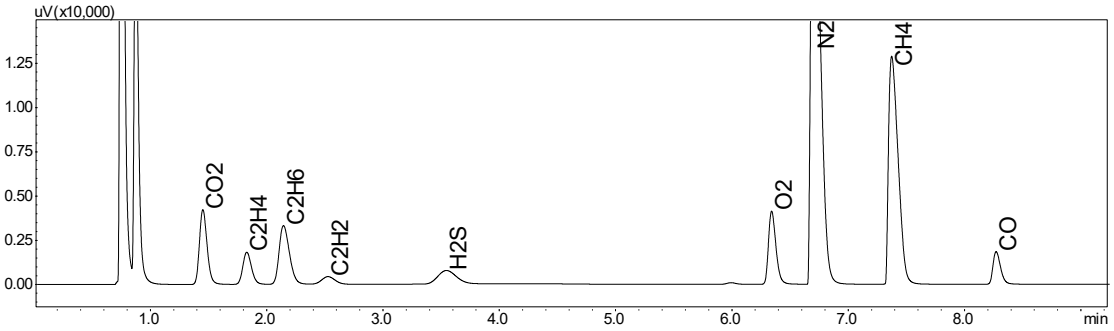


Fig.2 Chromatogram of TCD-1

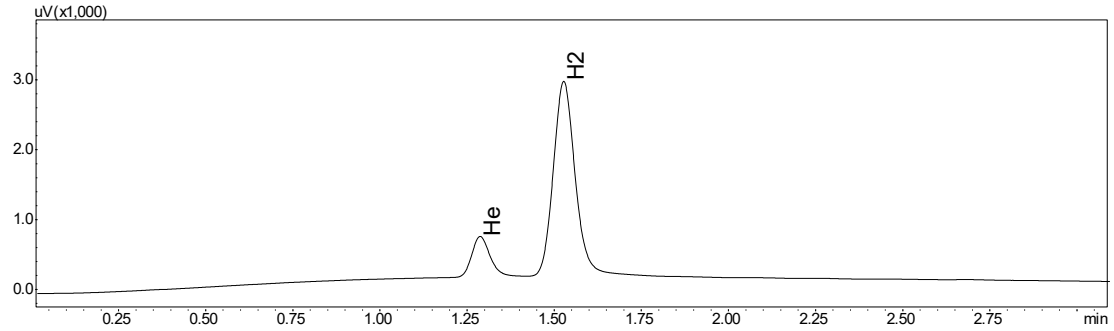


Fig.3 Chromatogram of TCD-2

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No.121

# System Gas Chromatograph

## Fast NGA System without He/H2 Analysis

## Nexis GC-2030 FRGA-II2
## GC-2014 FRGA-II2

Return to Table

This GC system is designed for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 5 valves and 8 columns are used in this GC system. Sample is loaded into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated by an Alumina capillary column and detected by FID. Using a P-N column, Air+CO+CH4 elute as a mixed peak to packed column MS-5A, then separated, switching the valve, CO2, C2, H2S elute to a P-Q column then separated. These components are detected by TCD. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Four valves / five packed column and one capillary with Two TCD detectors and one FID detector

**Sample Information:**
Permanent gas ,C1-C6

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | O2 | 0.010% | 20.0% | TCD-1 |
| 2 | N2 | 0.010% | 50.0% | TCD-1 |
| 3 | CH4 | 0.010% | 80.0% | TCD-1 |
| 4 | CO | 0.010% | 5.0% | TCD-1 |
| 5 | CO2 | 0.010% | 20.0% | TCD-1 |
| 6 | C2H4 | 0.010% | 10.0% | TCD-1 |
| 7 | C2H6 | 0.010% | 10.0% | TCD-1 |
| 8 | C2H2 | 0.010% | 10.0% | TCD-1 |
| 9 | H2S | 0.100% | 30.0% | TCD-1 |
| 10 | C3H8 | 0.001% | 5.0% | FID |
| 11 | C3H6 | 0.001% | 5.0% | FID |
| 12 | i-C4H10 | 0.001% | 1.0% | FID |
| 13 | n-C4H10 | 0.001% | 1.0% | FID |
| 14 | Propadiene(C3H4) | 0.001% | 1.0% | FID |
| 15 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 16 | 1-C4H8 | 0.001% | 0.5% | FID |
| 17 | i-C4H8 | 0.001% | 0.5% | FID |
| 18 | Cis-2-C4H8 | 0.001% | 0.5% | FID |
| 19 | i-C5H12 | 0.001% | 0.5% | FID |
| 20 | n-C5H12 | 0.001% | 0.5% | FID |
| 21 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 22 | C3H4 | 0.001% | 0.5% | FID |
| 23 | C6+ | 0.001% | 1.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Two TCD channels and one FID channel
- Calorific value software is available
- Good repeatability

## Typical Chromatograms

Return to Table

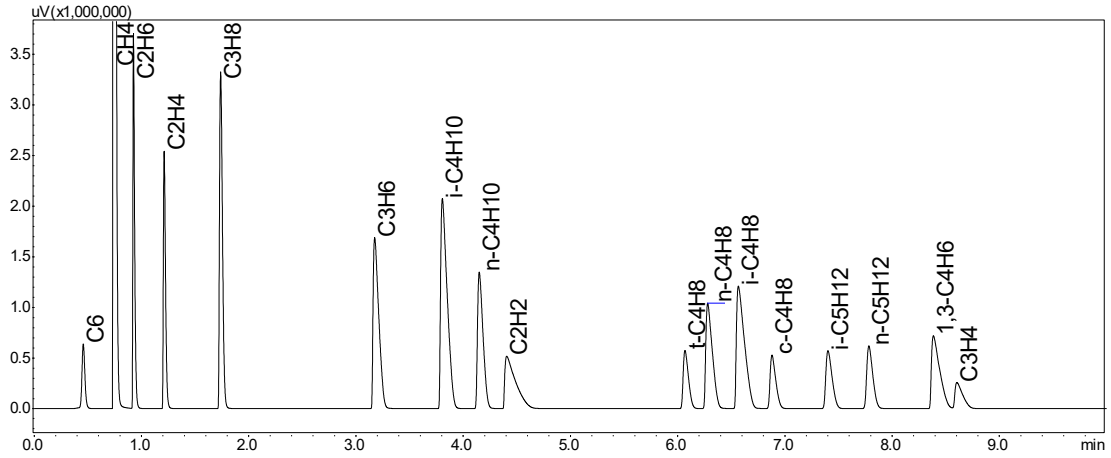


Fig.1 Chromatogram of FID

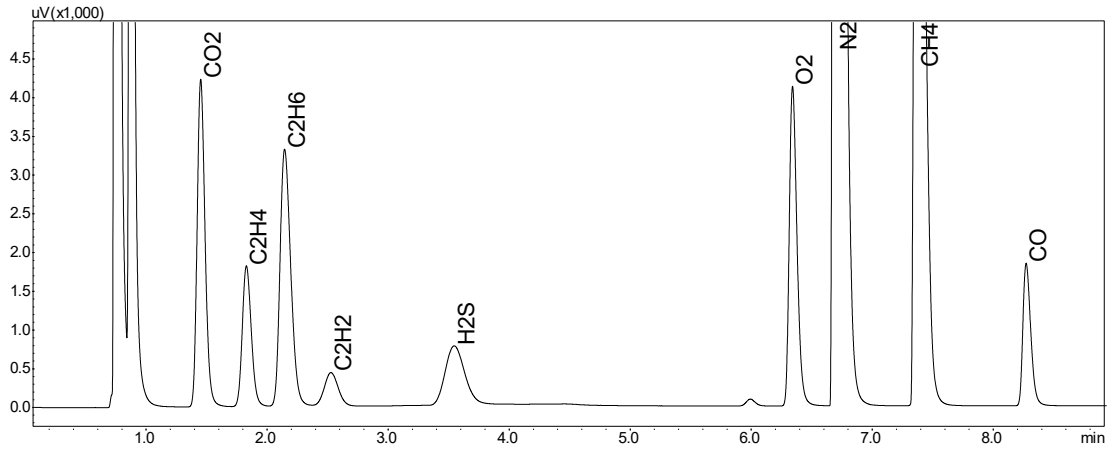


Fig. 2 Chromatogram of TCD

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No.43

# System Gas Chromatograph

# High Speed Refinery Gas Analyzer
# Nexis GC-2030HSRGA1
# GC-2014HSRGA1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This analyzer uses a total of four valves and eight columns. The Sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually through an Alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. At the same time, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by a TCD. H2 will be separated by MS-5A and, with the other components vented out, detected by another TCD using N2 as carrier gas. The final analysis time is approximately six minutes. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

### System Configuration:
Four valves / eight capillary and packed columns with two TCD / one FID detectors

### Sample Information:
He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ , $C_{6+}$

### Methods met:
ASTM-D1945, D1946, D3588, GPA-2261

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.01% | 10.0% |
| 2 | H2 | 0.01% | 80.0% |
| 3 | O2 | 0.01% | 50.0% |
| 4 | N2 | 0.01% | 50.0% |
| 5 | CH4 | 0.01% | 80.0% |
| 6 | CO | 0.01% | 10.0% |
| 7 | CO2 | 0.01% | 30.0% |
| 8 | C2H4 | 0.01% | 10.0% |
| 9 | C2H6 | 0.01% | 10.0% |
| 10 | C2H2 | 0.01% | 10.0% |
| 11 | H2S | 0.10% | 30.0% |
| 13 | C3H8 | 0.01% | 5.0% |
| 14 | C3H6 | 0.01% | 5.0% |
| 15 | i-C4H10 | 0.01% | 1.0% |
| 16 | n-C4H10 | 0.01% | 1.0% |
| 17 | C3H4 | 0.01% | 1.0% |
| 18 | C2H2 | 0.01% | 1.0% |
| 19 | Other Hydrocarbons | 0.01% | 0.5% |
| 20 | C6 plus | 0.01% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 6 minutes analysis for refinery gases analysis with H2S can be carried out
- Dual TCD with FID channels for simultaneous analysis
- By using split/splitless injector, liquid hydrocarbons can be analyzed by the FID
- Good separation for H2 and He, and full range capability for H2

## Typical Chromatograms

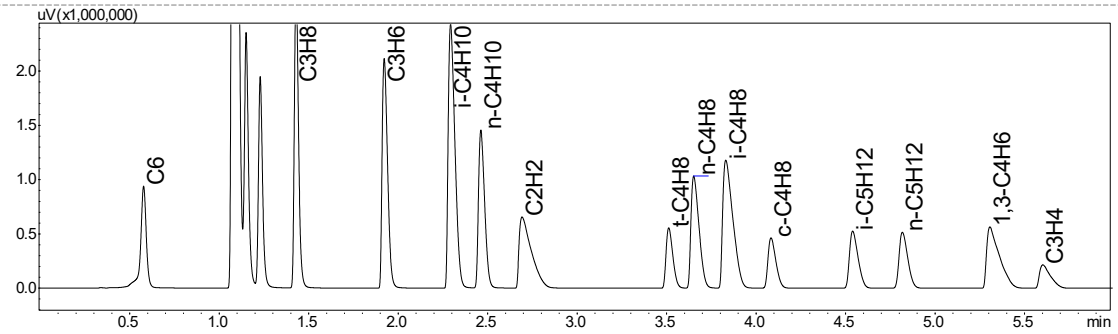


Fig. 1 Chromatogram of FID-1

Return to Table

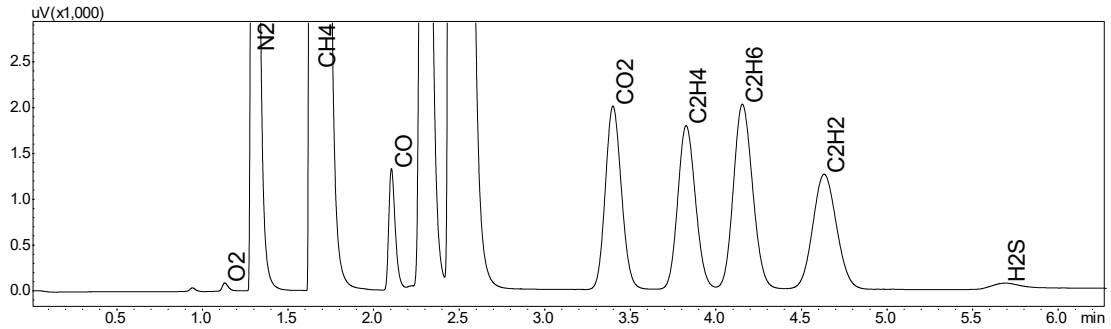


Fig. 2 Chromatogram of TCD-1

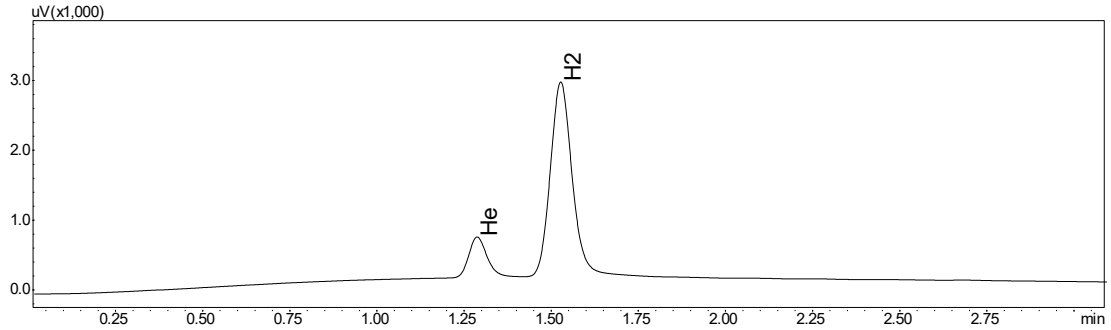


Fig. 3 Chromatogram of TCD-2

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No.44

# System Gas Chromatograph

# High Speed Refinery Gas Analyzer
# Nexis GC-2030HSRGA2
# GC-2014HSRGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This GC uses a total of four valves and six columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually through an alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. At the same time, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by a TCD. The final analysis time is approximately six minutes. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Three valves / six capillary and packed columns with TCD / FID detectors

**Sample Information:**
$O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ , $C_{6+}$

**Methods met:**
ASTM-D1945, D1946, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.01% | 50.0% |
| 2 | N2 | 0.01% | 50.0% |
| 3 | CH4 | 0.01% | 80.0% |
| 4 | CO | 0.01% | 10.0% |
| 5 | CO2 | 0.01% | 30.0% |
| 6 | C2H4 | 0.01% | 10.0% |
| 7 | C2H6 | 0.01% | 10.0% |
| 8 | C2H2 | 0.01% | 10.0% |
| 9 | H2S | 0.10% | 30.0% |
| 10 | C3H8 | 0.01% | 5.0% |
| 11 | C3H6 | 0.01% | 5.0% |
| 12 | i-C4H10 | 0.01% | 1.0% |
| 13 | n-C4H10 | 0.01% | 1.0% |
| 14 | C3H4 | 0.01% | 1.0% |
| 15 | C2H2 | 0.01% | 1.0% |
| 16 | Other Hydrocarbons | 0.01% | 0.5% |
| 17 | C6 plus | 0.01% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 6 minutes analysis for refinery gases analysis with H2S can be carried out
- TCD with FID channels for simultaneous analysis
- By using split/splitless injector, liquid hydrocarbons can be analyzed by the FID
- Calorific value software is available

## Typical Chromatograms

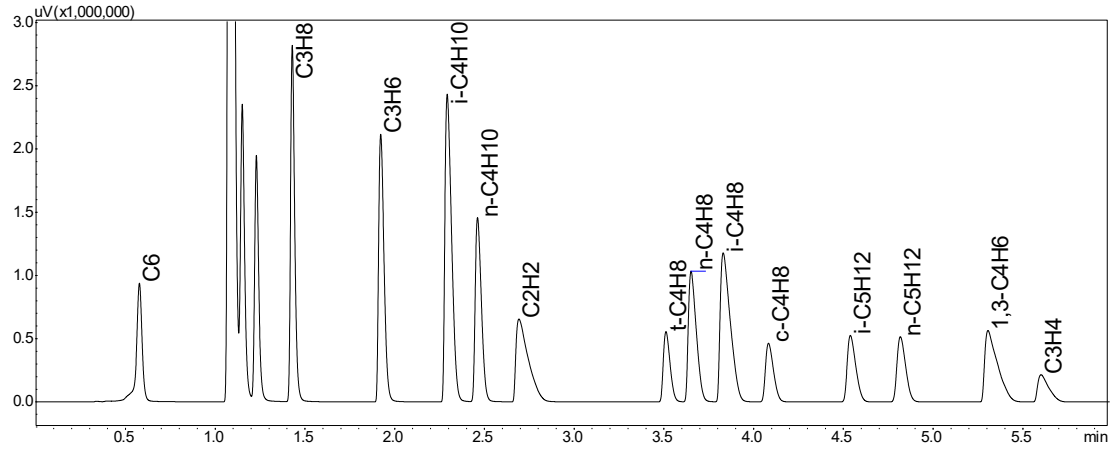


Fig. 1 Chromatogram of FID

Return to Table

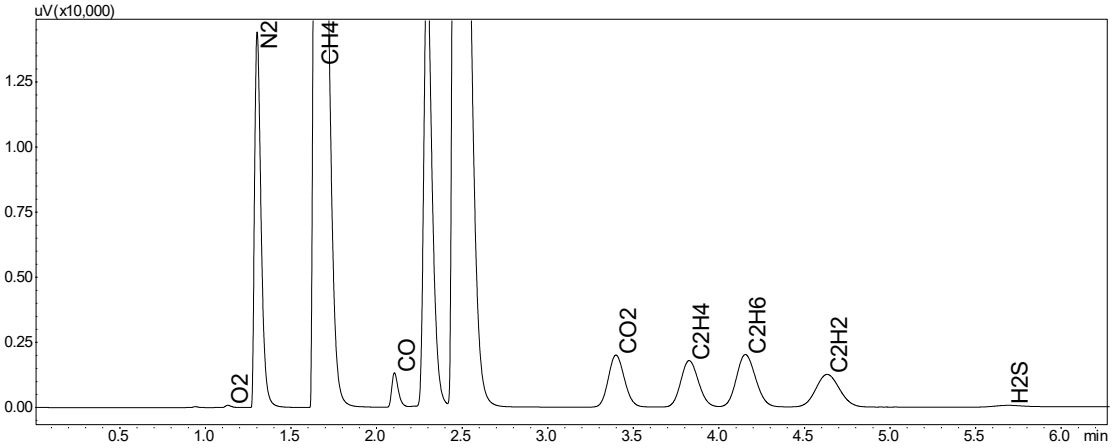


Fig. 2 Chromatogram of TCD

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No.45

# System Gas Chromatograph

# Extended Refinery Gas Analyzer
# Nexis GC-2030ERGA1
# GC-2014ERGA1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This GC is equipped with a total of four valves and nine columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually through an alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. At the same time, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by a TCD-2014. The back-flushed components eluted from Porapak-N analysis are transferred to an Rtx-1 column in the second oven for separation of C6– C13 hydrocarbons, and detected by FID. H2 will be separated by MS-5A and, with the other components vented out, detected by another TCD using N2 as carrier gas. The final analysis time is approximately 30 minutes. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

### System Configuration:
Four valves / eight capillary and packed columns with two FID / two TCD detectors

### Sample Information:
$H_2$, He, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$~$C_{13}$

### Methods met:
ASTM-D1945, D1946, D3588, GPA-2261

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.010% | 10.0% |
| 2 | H2 | 0.010% | 10.0% |
| 3 | O2 | 0.010% | 20.0% |
| 4 | N2 | 0.010% | 50.0% |
| 5 | CH4 | 0.010% | 10.0% |
| 6 | CO | 0.010% | 5.0% |
| 7 | CO2 | 0.010% | 20.0% |
| 8 | C2H4 | 0.010% | 10.0% |
| 9 | C2H6 | 0.010% | 10.0% |
| 10 | C2H2 | 0.010% | 10.0% |
| 11 | H2S | 0.100% | 30.0% |
| 12 | C3H8 | 0.001% | 5.0% |
| 13 | C3H6 | 0.001% | 5.0% |
| 14 | i-C4H10 | 0.001% | 1.0% |
| 15 | n-C4H10 | 0.001% | 1.0% |
| 16 | Propadiene | 0.001% | 1.0% |
| 17 | Other C4 and C5 | 0.001% | 0.5% |
| 18 | C6-C13 | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual TCD with dual FID channels for simultaneous analysis refinery gas
- By using split/splitless injector, liquid hydrocarbons can be analyzed by the FID
- By using second GC oven, extended hydrocarbons up to C18 can be analyzed
- Simple software enables easy dual oven operation
- Good separation for H2 and He, and full range capability for H2

## Typical Chromatograms

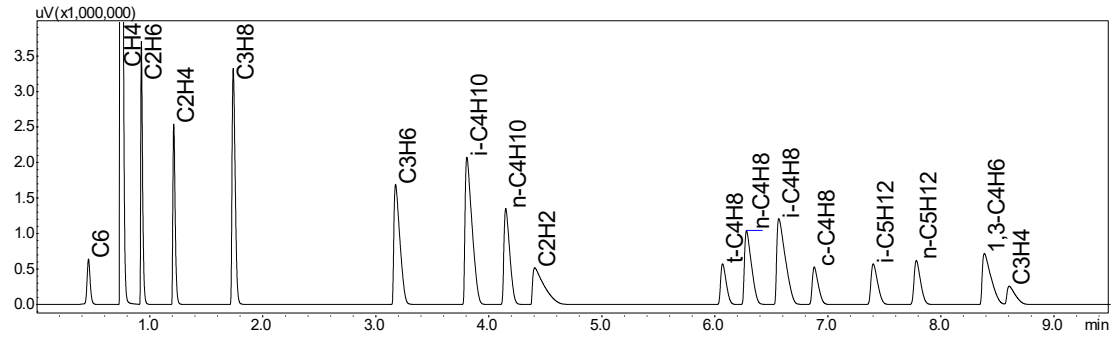


Fig. 1 Chromatogram of FID-1

Return to Table

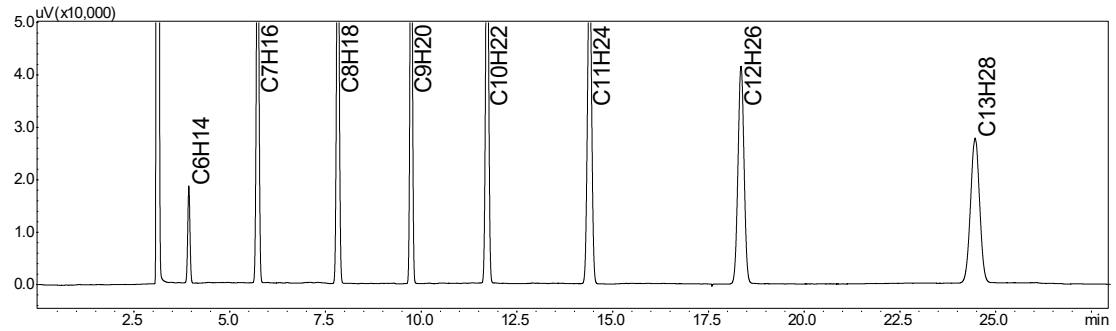


Fig. 2 Chromatogram of FID-2

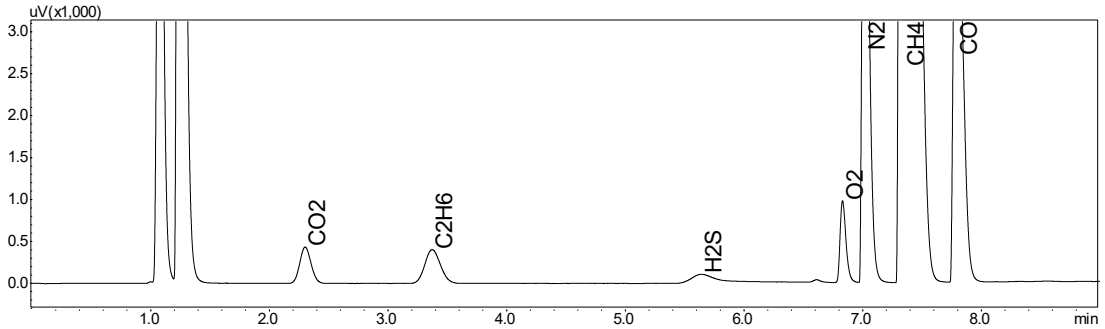


Fig. 3 Chromatogram of TCD-1

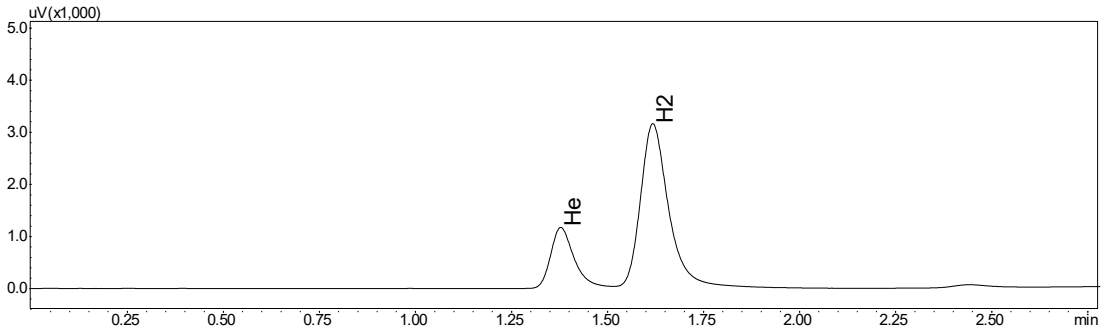


Fig. 4 Chromatogram of TCD-2

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No.46

# System Gas Chromatograph

# Extended Refinery Gas Analyzer
# Nexis GC-2030ERGA2
# GC-2014ERGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This GC uses a total of four valves and nine columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually through an Alumina capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. At the same time, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by a TCD. The back-flushed components eluted from Porapak-N for O2, N2, CH and CO analysis are transferred to an Rtx-1 column in the second oven for separation of C6–C13 hydrocarbons, and detected by FID. The final analysis time is approximately 30 minutes. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Three valves / seven capillary and packed columns with one TCD / two FID detectors

**Sample Information:**
$O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$~$C_{13}$

**Methods met:**
ASTM-D1945, D1946, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.010% | 20.0% |
| 2 | N2 | 0.010% | 50.0% |
| 3 | CH4 | 0.010% | 10.0% |
| 4 | CO | 0.010% | 5.0% |
| 5 | CO2 | 0.010% | 20.0% |
| 6 | C2H4 | 0.010% | 10.0% |
| 7 | C2H6 | 0.010% | 10.0% |
| 8 | C2H2 | 0.010% | 10.0% |
| 9 | H2S | 0.100% | 30.0% |
| 10 | C3H8 | 0.001% | 5.0% |
| 11 | C3H6 | 0.001% | 5.0% |
| 12 | i-C4H10 | 0.001% | 1.0% |
| 13 | n-C4H10 | 0.001% | 1.0% |
| 14 | Propadiene | 0.001% | 1.0% |
| 15 | Other C4 and C5 | 0.001% | 0.5% |
| 16 | C6-C13 | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single TCD with dual FID channels for simultaneous analysis of refinery gas
- By using split/splitless injector, liquid hydrocarbons can be analyzed by the FID
- By using second GC oven, extended hydrocarbons up to C18 can be analyzed
- Simple software enables easy dual oven operation

## Typical Chromatograms

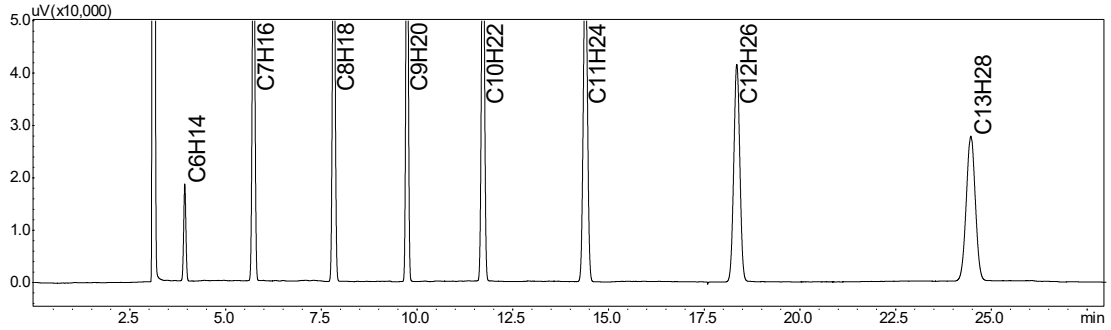


Fig. 1 Chromatogram of FID-1

Return to Table

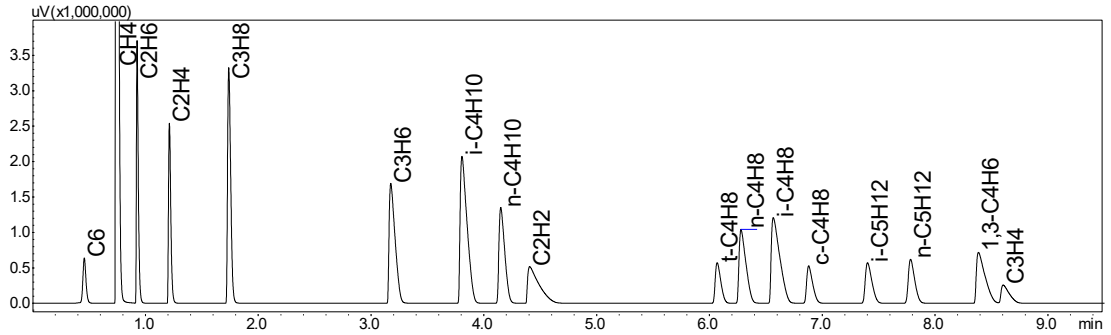


Fig. 2 Chromatogram of FID-2

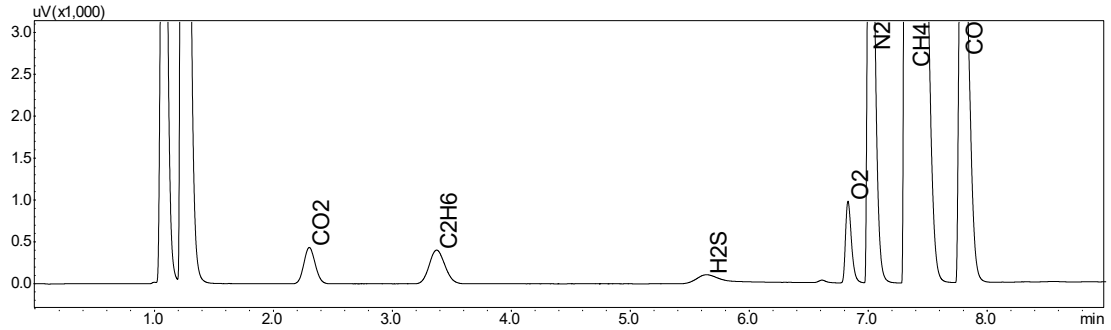


Fig. 3 Chromatogram of TCD-2

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# Ultra-Fast Refinery Gas Analysis

The Ultrafast RGA system utilizes the new Barrier Discharge Ionization Detector (BID) technology coupled with Nexis GC-2030 to create new system GC for ultrafast, high-sensitivity analysis. Since the electrode creating Helium plasma is totally isolated from the carrier gas, there is no chance to contaminate this electrode with a dirty sample. This enables long-term stability.

| **Tracera UFRGA Series Lineup** | | | |
|---|---|---|---|
| **Target compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6+(backflush) | BID, FID | 16 minutes | **No. 126** |
| $H_2$, $O_2$, $N_2$, $H_2S$, CO, $CO_2$, C1-C5, C6-C13 | BID, FIDx2 | 10 minutes | **No. 127** |

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Application Data Sheet

No.126

# System Gas Chromatograph

# BID Ultra-Fast Refinery Gas Analyzer Nexis GC-2030 BIDUFRGA

Return to Table

This GC system is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 3 valves and 6 columns are used in this GC system. The sample is loaded into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C1 through to C5 to be separated by an Alumina capillary column and detected by FID. A MS-5A separates H2, O2, N2, CH4, CO while CO2, C2H4, C2H6, C2H2, H2S are separated by Rtx-Q plot column and detected by a BID. The final analysis time is approximately 5.5 minutes. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Three valves / three packed columns and three capillary columns with one BID detector and one FID detector

**Sample Information:**
Permanent gas,C1-C6,$H_2S$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Remarks |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.001% | 10.0% | BID |
| 2 | O2 | 0.001% | 10.0% | BID |
| 3 | N2 | 0.001% | 10.0% | BID |
| 4 | CO | 0.001% | 10.0% | BID |
| 5 | CO2 | 0.001% | 10.0% | BID |
| 6 | C2H4 | 0.001% | 10.0% | BID |
| 7 | C2H6 | 0.001% | 10.0% | BID |
| 8 | C2H2 | 0.001% | 10.0% | BID |
| 9 | H2S | 0.01% | 30.0% | BID |
| 10 | CH4 | 0.01% | 80.0% | FID |
| 11 | C3H8 | 0.001% | 5.0% | FID |
| 13 | C3H6 | 0.001% | 5.0% | FID |
| 14 | i-C4H10 | 0.001% | 1.0% | FID |
| 15 | n-C4H10 | 0.001% | 1.0% | FID |
| 16 | C3H4 | 0.001% | 1.0% | FID |
| 17 | C2H2 | 0.001% | 1.0% | FID |
| 18 | trans-C4H8 | 0.001% | 0.5% | FID |
| 19 | 1-C4H8 | 0.001% | 0.5% | FID |
| 20 | i-C4H8 | 0.001% | 0.5% | FID |
| 21 | cis-C4H8 | 0.001% | 0.5% | FID |
| 22 | i-C5H12 | 0.001% | 0.5% | FID |
| 23 | n-C5H12 | 0.001% | 0.5% | FID |
| 24 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 25 | C3H4 | 0.001% | 0.5% | FID |
| 26 | C6 plus | 0.001% | 0.5% | FID |

Concentration range may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- Two channels with FID /BID detectors realizes high-speed analysis
- Linear response, simplifies calibration

## Typical Chromatograms

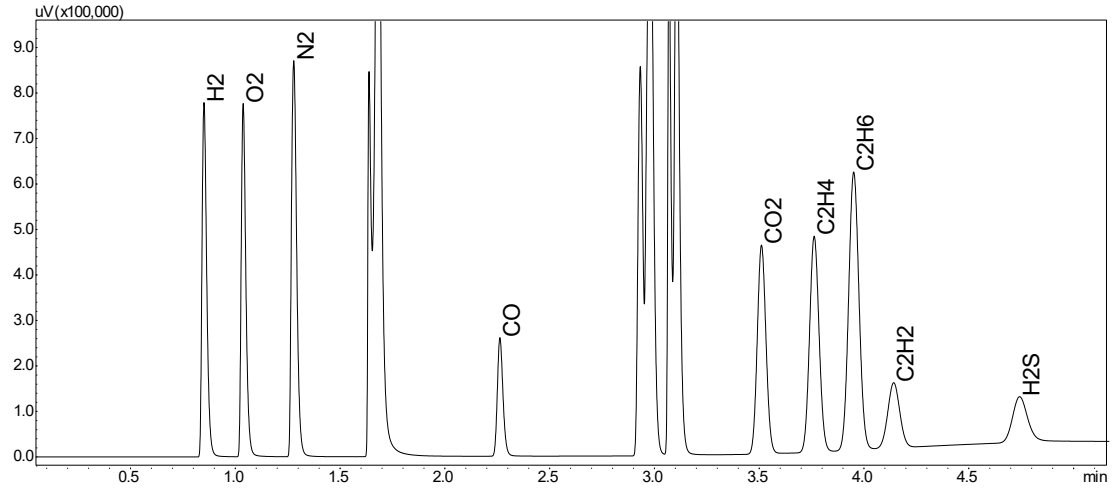


Fig. 1 Chromatogram of BID

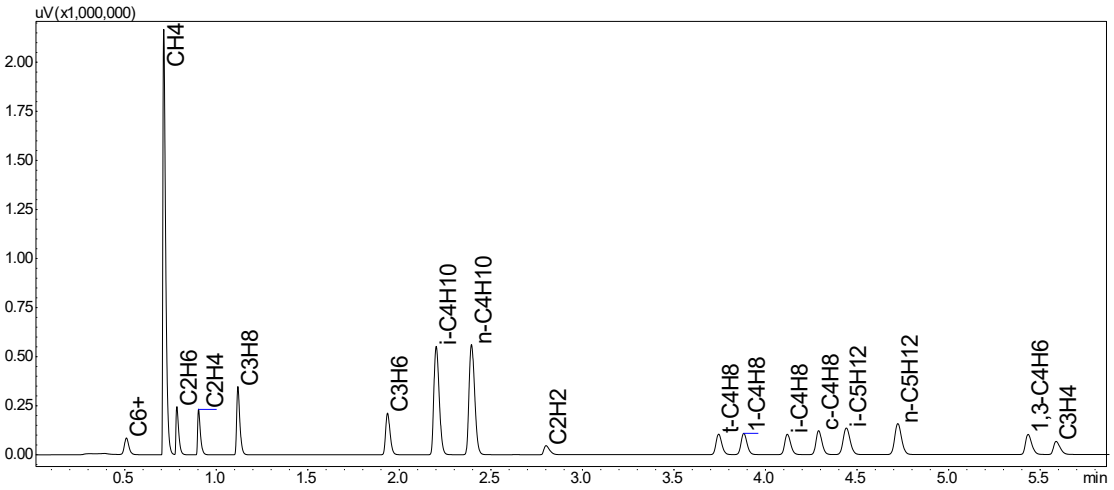


Fig. 2 Chromatogram of FID

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No.127

# System Gas Chromatograph

## Extend RGA System with BID Analysis
## Nexis GC-2030 BIDERGA-S

Return to Table

This GC system is designed for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 4 valves and 7 columns are used in this GC system. The sample is loaded into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C1through to C5 to be separated by an Alumina capillary column and detected by FID-1. The extended C6 through C13 hydrocarbons are separated by an Rtx-1 capillary column then detected by an FID-2. Finally, a MS-5A separates H2, O2, N2, CH4, CO while CO2, C2H4, C2H6, C2H2, H2S are separated by Rtx-Q plot column. Each is detected by a BID. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Four valves / three packed columns and four capillary columns with one BID detector and two FID detectors

**Sample Information:**
Permanent gas,C1-C13,$H_2S$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Remarks |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.001% | 80.0% | BID |
| 2 | O2 | 0.001% | 50.0% | BID |
| 3 | N2 | 0.001% | 50.0% | BID |
| 4 | CO | 0.001% | 10.0% | BID |
| 5 | CO2 | 0.001% | 30.0% | BID |
| 6 | C2H4 | 0.001% | 10.0% | BID |
| 7 | C2H6 | 0.001% | 10.0% | BID |
| 8 | C2H2 | 0.001% | 10.0% | BID |
| 9 | H2S | 0.01% | 30.0% | BID |
| 10 | CH4 | 0.001% | 80.0% | FID-1 |
| 11 | C3H8 | 0.001% | 5.0% | FID-1 |
| 13 | C3H6 | 0.001% | 5.0% | FID-1 |
| 14 | i-C4H10 | 0.001% | 1.0% | FID-1 |
| 15 | n-C4H10 | 0.001% | 1.0% | FID-1 |
| 16 | C3H4 | 0.001% | 1.0% | FID-1 |
| 17 | C2H2 | 0.001% | 1.0% | FID-1 |
| 18 | trans-C4H8 | 0.001% | 0.5% | FID-1 |
| 19 | 1-C4H8 | 0.001% | 0.5% | FID-1 |
| 20 | i-C4H8 | 0.001% | 0.5% | FID-1 |
| 21 | cis-C4H8 | 0.001% | 0.5% | FID-1 |
| 22 | i-C5H12 | 0.001% | 0.5 % | FID-1 |
| 23 | n-C5H12 | 0.001% | 0.5% | FID-1 |
| 24 | 1,3-C4H6 | 0.001% | 0.5% | FID-1 |
| 25 | C3H4 | 0.001% | 0.5% | FID-1 |
| 26 | C6 plus | 0.001% | 0.5% | FID-1 |
| 27 | C6 – C13 | 0.001% | 0.5% | FID-2 |

Concentration range may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- Enables higher boiling-point hydrocarbons analysis
- Linear response, simplifies calibration

## Typical Chromatograms

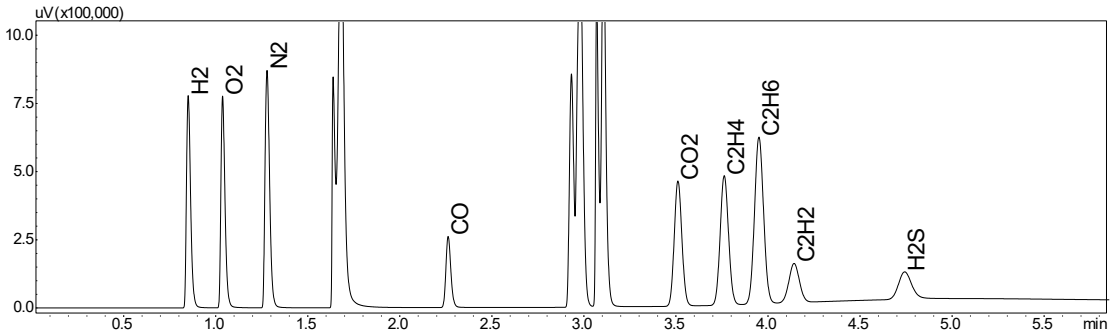


Fig. 1 Chromatogram of BID

Return to Table

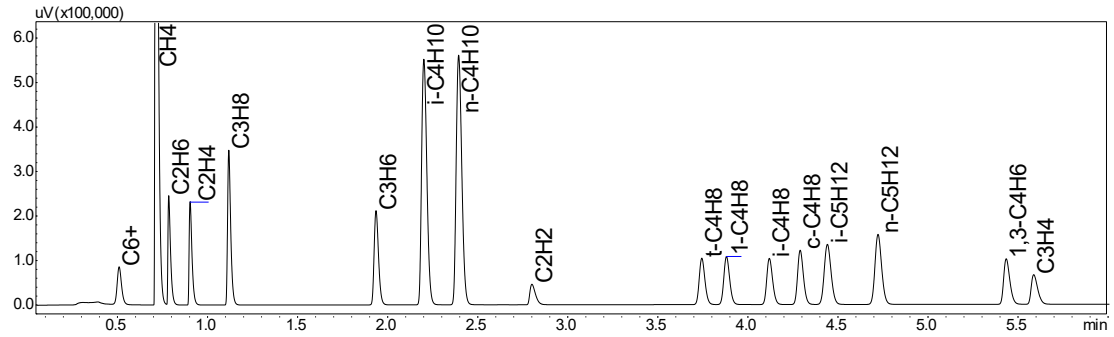


Fig. 2 Chromatogram of FID-1

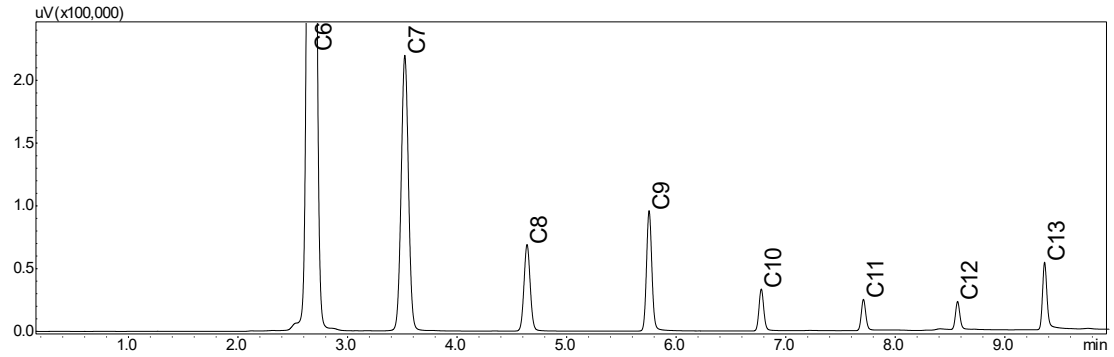


Fig. 3 Chromatogram of FID-2

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# Natural Gas Analysis

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 chemical composition analysis of natural gas and liquid natural gas. System is equipped with software that outputs reports according to ISO, BTU requirements. The ultrafast natural gas analyzer (UFNGA) is also available.

| Natural Gas Analysis System Lineup | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | Permanent gases, C1-C5, $H_2S$, C6+(backflush) | BID, FID | 5 minutes | **No. 125** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5, C6+(backflush) | TCDx2, FID | 10 minutes | **No. 118** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5, C6+(backflush) | TCD, FID | 10 minutes | **No. 119** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5, C6+ (backflush) | TCDx2, FID | 10 minutes | **No. 3** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5, C6+ (backflush) | TCD, FID | 10 minutes | **No. 4** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C14 | TCDx2, FID | 30 minutes | **No. 5** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C18 | TCDx2, FID | 28 minutes | **No. 6** |
| ASTM-D1945, ASTM-D3588, GPA-2261 | He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5 | TCD | 23 minutes | **No. 1** |
| ASTM-D1945, ASTM-D3588 | $O_2$, $N_2$, CO, $CO_2$, $H_2S$, C1-C5, C6+(backflush) | TCD | 23 minutes | **No. 2** |
| - | C1-C5 C6+(backflush) | FID | 27 minutes | **No. 55** |
| - | C1-C5 C6+(backflush) | FID | 10 minutes | **No. 56** |
| ISO6974-3 | Permanent gases, C1-C8 | TCDx2 | 10 minutes | **No. 60** |
| ISO6974-4 | Permanent gases, C1-C6 | TCD | 23 minutes | **No. 61** |

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No.125

# System Gas Chromatograph

## BID Ultra-Fast Natural Gas Analyzer
## Nexis GC-2030 BIDUFNGA

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This GC system provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 3 valves and 6 columns are used in this GC system. Sample is loaded into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C1 through to C5 to be separated by an alumina capillary column and detected by FID. Finally, using a MS-5A, H2, O2, N2, CH4, CO are separated meanwhile CO2, C2H4, C2H6, C2H2, H2S are separated by Rtx-Q plot column and detected by BID. The final analysis time is approximately 5 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Five valves / three packed columns and three capillary columns with one BID detector and one FID detector

**Sample Information:**
Permanent gas,C1-C6,$H_2S$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2 | 0.001% | 10.0% | BID |
| 2 | O2 | 0.001% | 10.0% | BID |
| 3 | N2 | 0.001% | 10.0% | BID |
| 4 | CO | 0.001% | 10.0% | BID |
| 5 | CO2 | 0.001% | 10.0% | BID |
| 6 | C2H4 | 0.001% | 10.0% | BID |
| 7 | C2H6 | 0.001% | 10.0% | BID |
| 8 | C2H2 | 0.001% | 10.0% | BID |
| 9 | H2S | 0.01% | 10.0% | BID |
| 10 | CH4 | 0.01% | 80.0% | FID |
| 11 | C3H8 | 0.001% | 10.0% | FID |
| 12 | i-C4H10 | 0.001% | 10.0% | FID |
| 13 | n-C4H10 | 0.001% | 10.0% | FID |
| 14 | i-C5H12 | 0.001% | 2.0% | FID |
| 15 | n-C5H12 | 0.001% | 2.0% | FID |
| 16 | C6+ | 0.001% | 0.5% | FID |

Concentration range may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- Two channels with FID / BID detectors realize high-speed analysis
- Linear response, simplifies calibration

## Typical Chromatograms

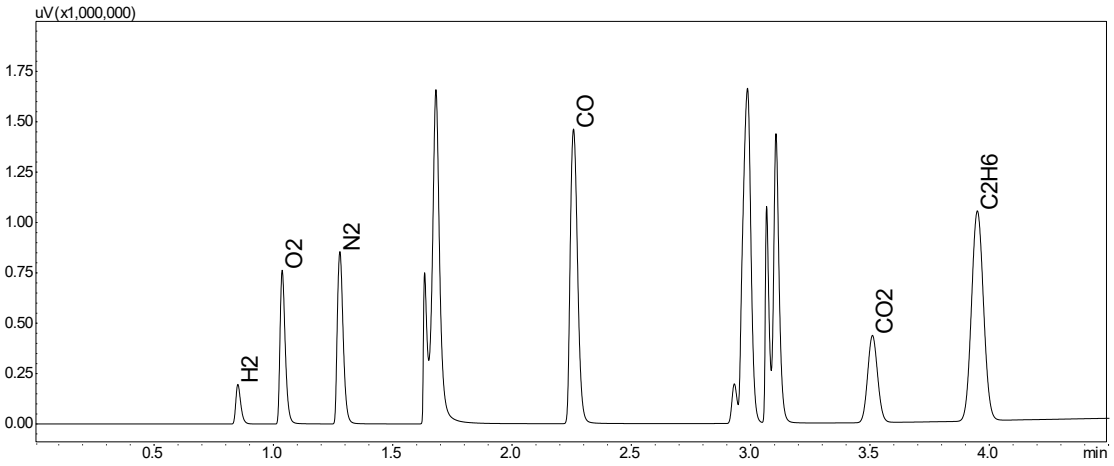


Fig. 1 Chromatogram of BID

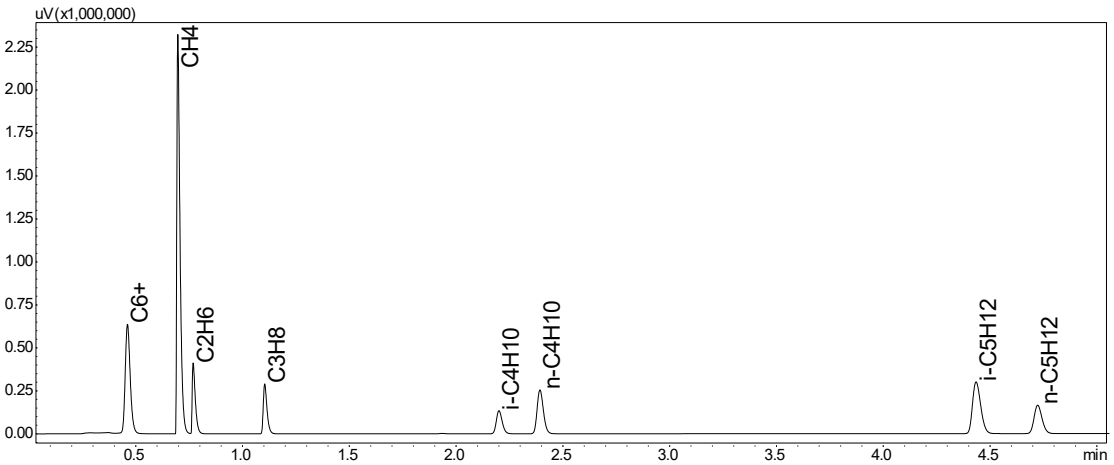


Fig. 2 Chromatogram of FID

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No.118

## System Gas Chromatograph

# Fast NGA System with He/H2 Analysis
# Nexis GC-2030 FNGA-II1
# GC-2014 FNGA-II1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 5 valves and 8 columns are used in this GC system. Sample is loaded into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated individually by a Rtx-1 capillary column and to be detected by FID with Split/splitless injector. Using pre-column P-N, C3+ components are vented out as a single peak. Using as main column P-N, Air+CO+CH4 are eluted as a mixed peak to a packed column MS-5A, and then separated. Switching the valve, CO2, C2, H2S are eluted to a P-Q column and then separated and detected by a TCD. He/H2 will be separated by an MS-5A. The other components are vented and detected by another TCD using N2 as carrier gas. The final analysis time is approximately 10 minutes. If He and H2 do not need to be measured, another Fast NGA system without He/H2 is also available. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Five valves / seven packed column and one capillary with two TCD detectors and one FID detector

**Sample Information:**
Permanent gas ,C1-C6

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | He | 0.010% | 10.0% | TCD-2 |
| 2 | H2 | 0.010% | 10.0% | TCD-2 |
| 3 | O2 | 0.010% | 20.0% | TCD-1 |
| 4 | N2 | 0.010% | 50.0% | TCD-1 |
| 5 | CH4 | 20.000% | 100.0% | TCD-1 |
| 6 | CO | 0.010% | 5.0% | TCD-1 |
| 7 | CO2 | 0.010% | 20.0% | TCD-1 |
| 8 | C2H6 | 0.010% | 10.0% | TCD-1 |
| 9 | H2S | 0.100% | 30.0% | TCD-1 |
| 10 | C3H8 | 0.001% | 10.0% | FID |
| 11 | i-C4H10 | 0.001% | 10.0% | FID |
| 12 | n-C4H10 | 0.001% | 10.0% | FID |
| 13 | i-C5H12 | 0.001% | 2.0% | FID |
| 14 | n-C5H12 | 0.001% | 2.0% | FID |
| 15 | C6+ | 0.001% | 0.5% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Two TCD channels and one FID channels
- Calorific value software is available
- Good repeatability

## Typical Chromatograms

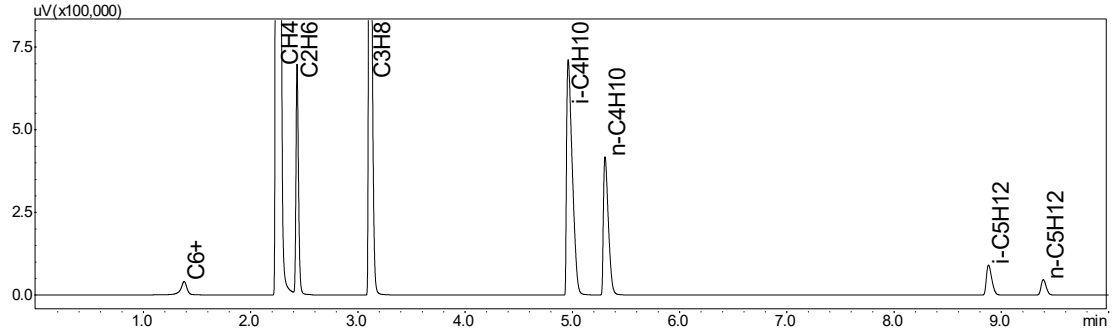


Fig.1 Chromatogram of FID

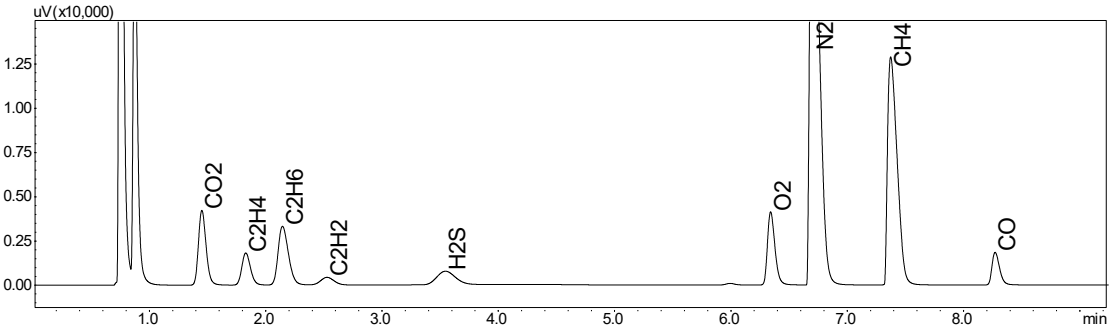


Fig.2 Chromatogram of TCD-1

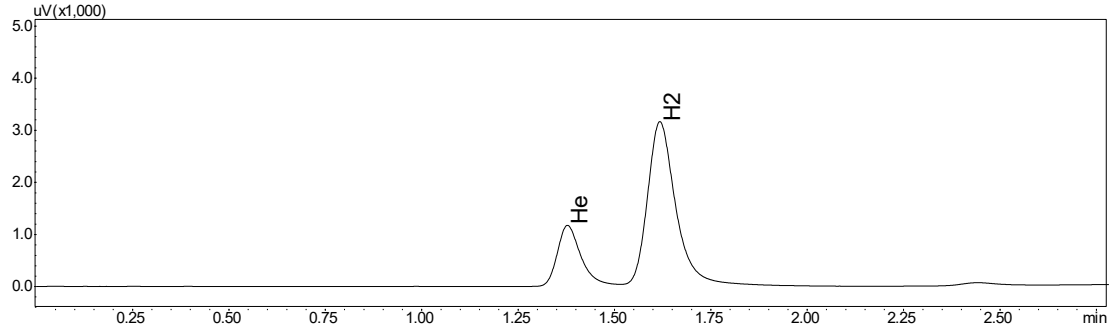


Fig.3 Chromatogram of TCD-2

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Application Data Sheet

No.119

# System Gas Chromatograph

# Fast NGA System without He/H2 Analysis Nexis GC-2030 FNGA-II2 GC-2014 FNGA-II2

Return to Table

This System is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 4 valves and 6 columns are used in this GC system. The sample is loaded into two sample loops for determination. Using a pre-column, the C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated by an Rtx-1 capillary column and to be detected by FID. Using as a main column P-N, Air+CO+CH4 are eluted as a one peak to a packed MS-5A column and then separated. Switching the valve, CO2, C2, H2S are eluted to a P-Q column, separated then detected by TCD. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Four valves / five packed column and one capillary with one TCD detector and one FID detector

**Sample Information:**
Permanent gas ,C1-C6

**Methods met:**
ASTM-D1945, ASTM-D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | O2 | 0.010% | 20.0% | TCD-1 |
| 2 | N2 | 0.010% | 50.0% | TCD-1 |
| 3 | CH4 | 20.000% | 100.0% | TCD-1 |
| 4 | CO | 0.010% | 5.0% | TCD-1 |
| 5 | CO2 | 0.010% | 20.0% | TCD-1 |
| 6 | C2H6 | 0.010% | 10.0% | TCD-1 |
| 7 | H2S | 0.100% | 30.0% | TCD-1 |
| 8 | C3H8 | 0.001% | 10.0% | FID |
| 9 | i-C4H10 | 0.001% | 10.0% | FID |
| 10 | n-C4H10 | 0.001% | 10.0% | FID |
| 11 | i-C5H12 | 0.001% | 2.0% | FID |
| 12 | n-C5H12 | 0.001% | 2.0% | FID |
| 13 | C6+ | 0.001% | 0.5% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- One TCD channel and one FID channel
- Calorific value software is available
- Good repeatability

## Typical Chromatograms

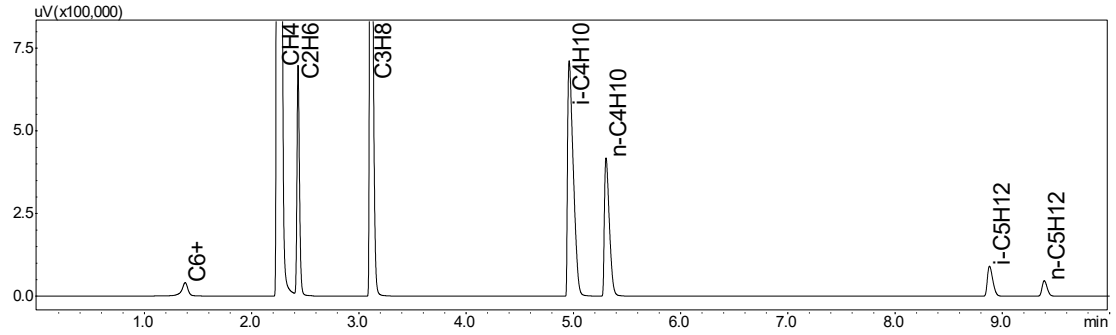


Fig.1 Chromatogram of FID

Return to Table

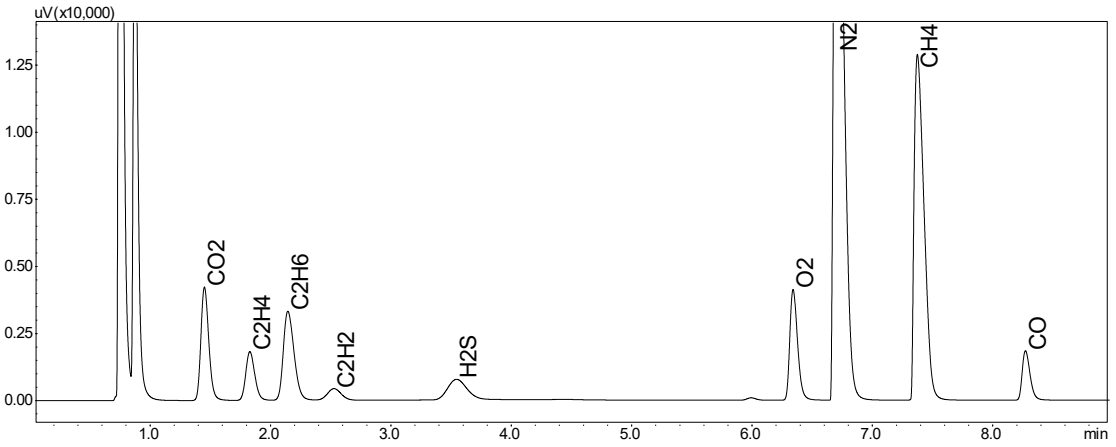


Fig.2 Chromatogram of TCD

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No.3

# System Gas Chromatograph

# Fast Natural Gas Analyzer
# Nexis GC-2030FNGA1
# GC-2014FNGA1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown below. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This system is configured with a total of four valves and eight columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually using an Rtx-1 capillary column and detected by FID. Using an MS-5A column, O2, N2, CH4, and CO are separated. Simultaneously, CO2, C2, and H2S are separated with an Rtx-Q plot column and detected by the TCD. He/H2 will be separated by on a separate MS-5A column ,while backflushing the other constituents and , detected by another TCD using N2 as carrier gas. The final analysis time is approximately 10 minutes. If He and H2 do not need to be measured, a different Fast NGA system without He/H2 is available. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

### System Configuration:
Four valves / eight capillary and packed columns with two TCD / one FID detectors

### Sample Information:
He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ by backflush

### Methods met:
ASTM-D1945, D3588, GPA-2261

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.010% | 10.0% |
| 2 | H2 | 0.010% | 10.0% |
| 3 | O2 | 0.010% | 20.0% |
| 4 | N2 | 0.010% | 50.0% |
| 5 | CH4 | 20.000% | 100.0% |
| 6 | CO | 0.010% | 5.0% |
| 7 | CO2 | 0.010% | 20.0% |
| 8 | C2H6 | 0.010% | 10.0% |
| 9 | H2S | 0.100% | 30.0% |
| 10 | C3H8 | 0.001% | 10.0% |
| 11 | i-C4H10 | 0.001% | 10.0% |
| 12 | n-C4H10 | 0.001% | 10.0% |
| 13 | i-C5H12 | 0.001% | 2.0% |
| 14 | n-C5H12 | 0.001% | 2.0% |
| 15 | C6+ | 0.001% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 10 minutes analysis for natural gas
- Dual TCD, FID channels
- Calorific value software is available
- Versatile software easy GC system operation

## Typical Chromatograms

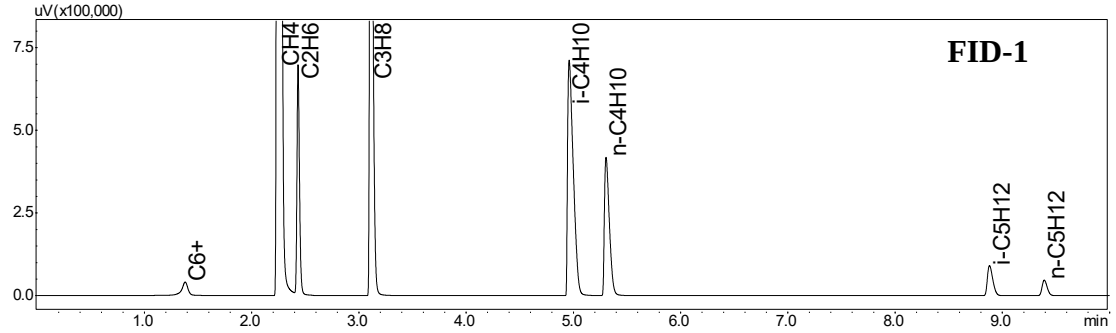


Fig. 1 Chromatogram of FID-1

Return to Table

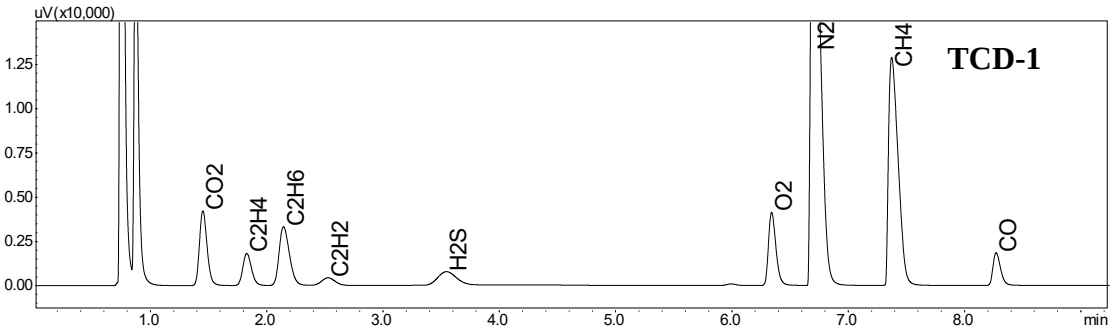


Fig. 2 Chromatogram of TCD-1

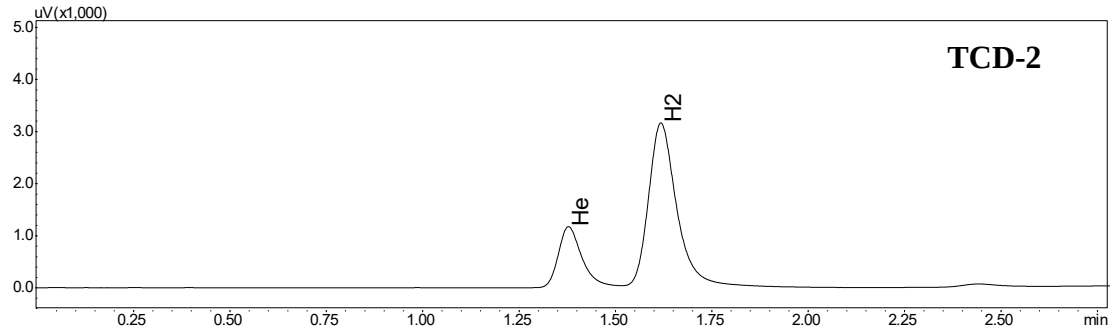


Fig. 3 Chromatogram of TCD-2

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No.4

# System Gas Chromatograph

# Fast Natural Gas Analyzer
# Nexis GC-2030FNGA2
# GC-2014FNGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This system uses a total of three valves and six columns. The sample is introduced into four sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through/to C5 to be separated individually using an Rtx-1 capillary column and detected by FID. Finally, using MS-5A, O2, N2, CH4, and CO are separated. simultaneously, CO2, C2, and H2S are separated with an Rtx-Q plot column and detected by theTCD. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

### System Configuration:
Three valves / six capillary and packed columns with TCD / FID detectors

### Sample Information:
$O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ by backflush

### Methods met:
ASTM-D1945, D3588, GPA-2261

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.010% | 20.0% |
| 2 | N2 | 0.010% | 50.0% |
| 3 | CH4 | 20.000% | 100.0% |
| 4 | CO | 0.010% | 5.0% |
| 5 | CO2 | 0.010% | 20.0% |
| 6 | C2H6 | 0.010% | 10.0% |
| 7 | H2S | 0.100% | 30.0% |
| 8 | C3H8 | 0.001% | 10.0% |
| 9 | i-C4H10 | 0.001% | 10.0% |
| 10 | n-C4H10 | 0.001% | 10.0% |
| 11 | i-C5H12 | 0.001% | 2.0% |
| 12 | n-C5H12 | 0.001% | 2.0% |
| 13 | C6+ | 0.001% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Less than 10 minutes analysis for natural gas
- TCD, FID channels
- Calorific value software is available
- Versatile software easy GC system operation

## Typical Chromatograms

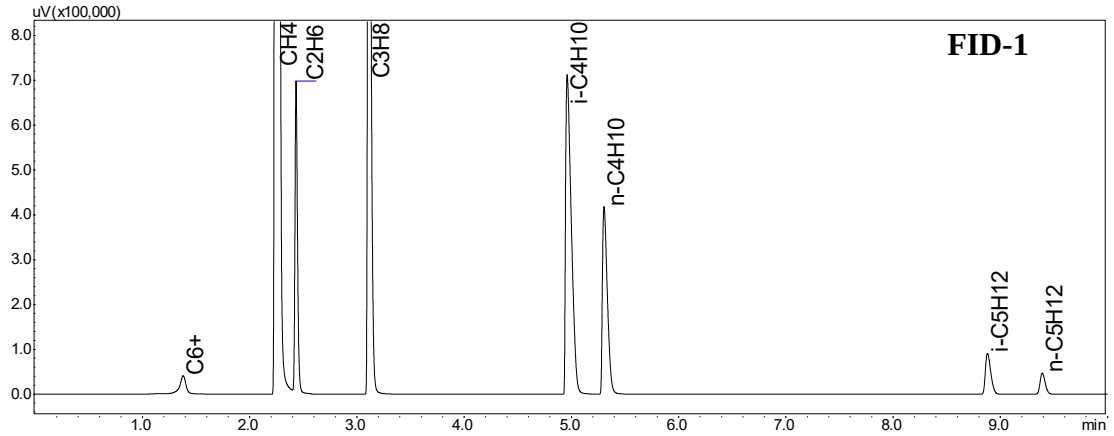


Fig. 1 Chromatogram of FID-1

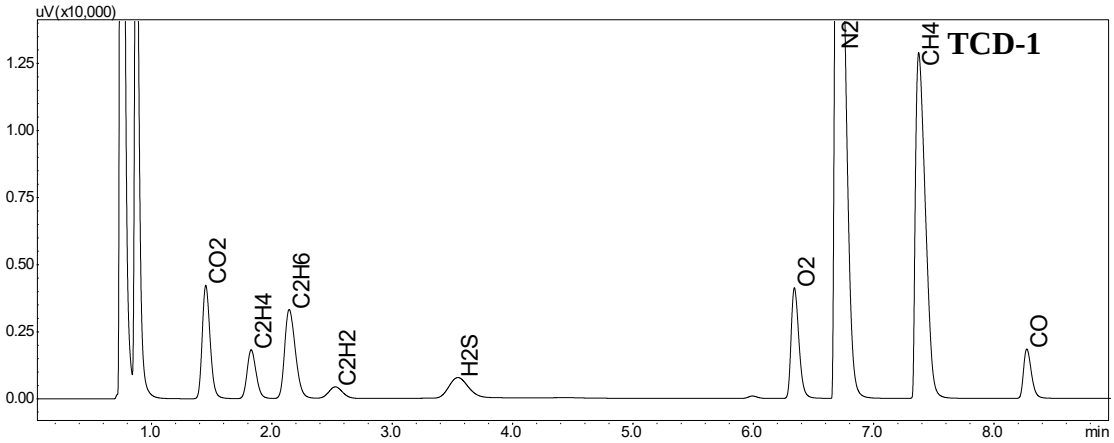


Fig. 2 Chromatogram of TCD-1

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No.5

# System Gas Chromatograph

# Extended Natural Gas Analyzer
# Nexis GC-2030ENGA1
# GC-2014ENGA1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. Itd provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This system is configured with a total of four valves and seven columns. The sample is introduced into four sample loops for determination. Using MS-5A, O2, N2, CH4, and CO are separated; simultaneously, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by the TCD. H2 will be separated by MS-5A and, with the other components vented out, detected by another TCD using N2 as carrier gas. In the channel of FID, C3-C14 will be separated with an Rtx-1 capillary column and detected by FID. The final analysis time is approximately 40 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software. The system's one oven accommodates these columns.

## Analyzer Information

**System Configuration:**
Four valves / seven capillary and packed columns with two TCD / one FID detectors

**Sample Information:**
He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$~$C_{14}$

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.010% | 10.0% |
| 2 | H2 | 0.010% | 10.0% |
| 3 | O2 | 0.010% | 20.0% |
| 4 | N2 | 0.010% | 50.0% |
| 5 | CH4 | 20.000% | 100.0% |
| 6 | CO | 0.010% | 5.0% |
| 7 | CO2 | 0.010% | 20.0% |
| 8 | C2H6 | 0.010% | 10.0% |
| 9 | H2S | 0.100% | 30.0% |
| 10 | C3H8 | 0.001% | 10.0% |
| 11 | i-C4H10 | 0.001% | 10.0% |
| 12 | n-C4H10 | 0.001% | 10.0% |
| 13 | i-C5H12 | 0.001% | 2.0% |
| 14 | n-C5H12 | 0.001% | 2.0% |
| 15 | C6 through C13 | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual TCD and FID channels
- C3-C14 separated by non-polar capillary column on FID
- Liquefied sample can be directly injected to split/splitless injector and analyzed by FID
- Versatile software easy GC system operation

## Typical Chromatograms

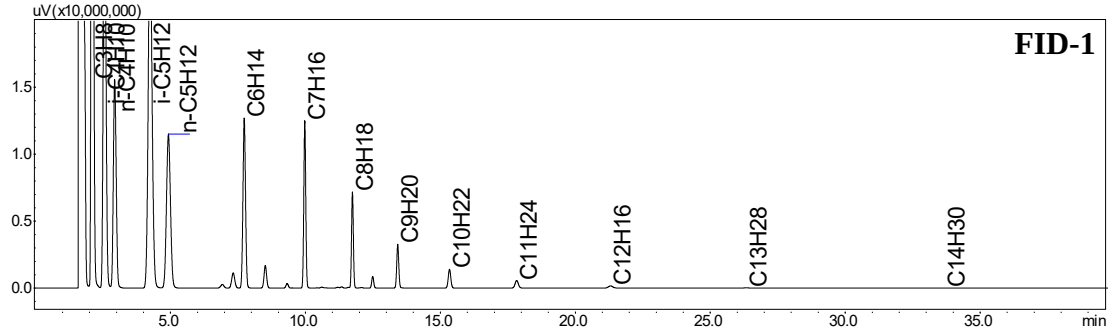


Fig. 1 Chromatogram of FID-1

Return to Table

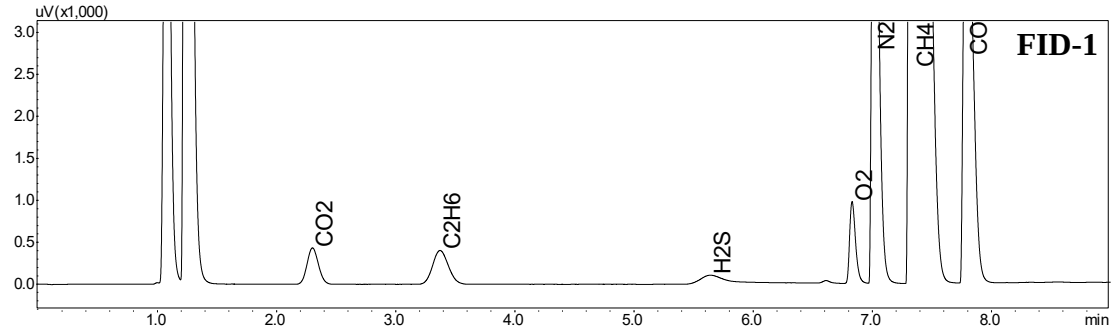


Fig. 2 Chromatogram of TCD-1

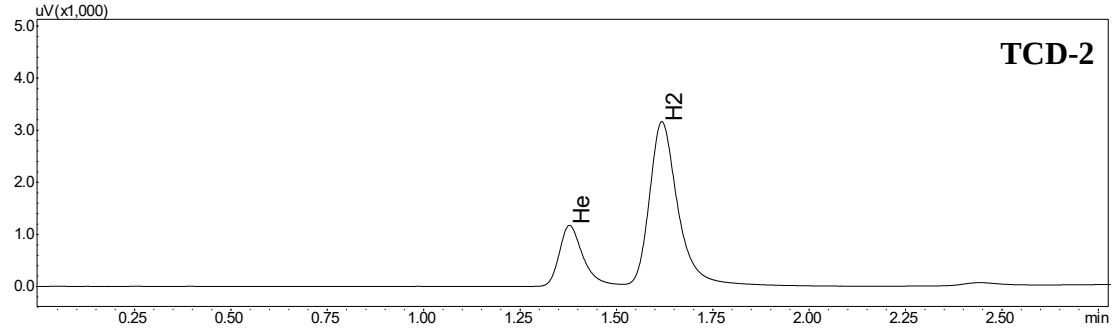


Fig. 3 Chromatogram of TCD-2

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No.6

# System Gas Chromatograph

# Extended Natural Gas Analyzer
# Nexis GC-2030ENGA2
# GC-2014ENGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This GC utilizes a total of four valves and seven columns. The sample is introduced into four sample loops for determination. Using MS-5A, O2, N2, CH4, and CO are separated simultaneously, CO2, C2, and H2S are separated using an Rtx-Q plot column and detected by the TCD. H2 will be separated by MS-5A and, with the other compounds vented out, detected by another TCD using N2 as carrier gas. In the channel of FID on the sub GC, C3-C18 will be separated with an Rtx-1 capillary column and detected by FID. The final analysis time is approximately 30 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software. The system has two ovens; one oven is used for the Rtx-Q plot column and MS-5A and the other is used for the Rtx-1 column.

## Analyzer Information

**System Configuration:**
Four valves / seven capillary and packed columns with two TCD / one FID detectors

**Sample Information:**
$H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$~$C_{18}$

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.010% | 10.0% |
| 2 | H2 | 0.010% | 10.0% |
| 3 | O2 | 0.010% | 20.0% |
| 4 | N2 | 0.010% | 50.0% |
| 5 | CH4 | 20.000% | 100.0% |
| 6 | CO | 0.010% | 5.0% |
| 7 | CO2 | 0.010% | 20.0% |
| 8 | C2H6 | 0.010% | 10.0% |
| 9 | H2S | 0.100% | 30.0% |
| 10 | C3H8 | 0.001% | 10.0% |
| 11 | i-C4H10 | 0.001% | 10.0% |
| 12 | n-C4H10 | 0.001% | 10.0% |
| 13 | i-C5H12 | 0.001% | 2.0% |
| 14 | n-C5H12 | 0.001% | 2.0% |
| 15 | C6 through C18 | 0.001% | 1.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual TCD and extended FID channels
- By using a second GC oven, the hydrocarbon analysis can be extended up to C18
- Liquid sample can be directly injected to split/splitless injector and analyzed by FID
- Versatile software easy GC system operation

## Typical Chromatograms

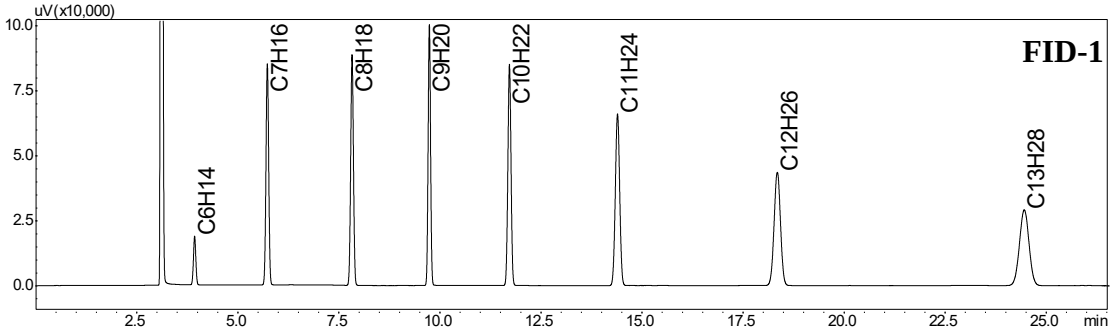


Fig. 1 Chromatogram of FID-1

Return to Table

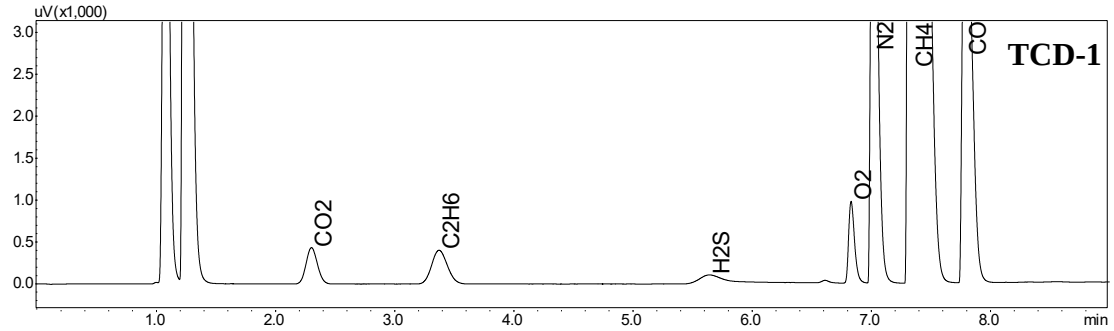


Fig. 2 Chromatogram of TCD-1

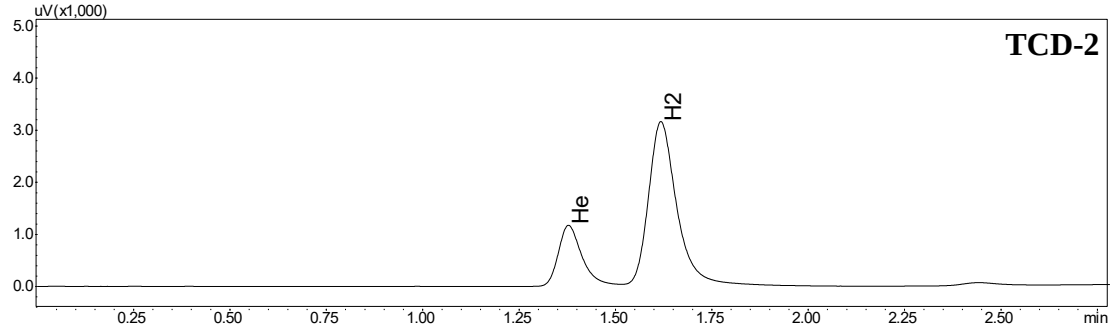


Fig. 3 Chromatogram of TCD-2

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No. 1

# System Gas Chromatograph

# Natural Gas Analyzer
# Nexis GC-2030NGA1
# GC-2014NGA1

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. The GC system uses a total of three valves and six columns. The sample is introduced into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows C3-C5, CO2, and C2H6 to be eluted to a TCD through a DC-200 column in that order. Finally, using MS-5A, O2, N2, CH4, and CO are separated and detected by the TCD, while He and H2 will be separated by MS-5A and, with the other compounds vented out, detected by a second TCD using N2 as carrier gas. The final analysis time is approximately 20 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Three valves / six packed columns with two TCD detectors

**Sample Information:**
He, $H_2$, $O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), $C_{6+}$ by backflush

**Methods met:**
ASTM-D1945, D3588, GPA-2261

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.01% | 10.0% |
| 2 | H2 | 0.01% | 10.0% |
| 3 | O2 | 0.01% | 20.0% |
| 4 | N2 | 0.01% | 50.0% |
| 5 | CH4 | 20.0% | 100% |
| 6 | CO | 0.01% | 5.0% |
| 7 | CO2 | 0.01% | 20.0% |
| 8 | C2H6 | 0.01% | 10.0% |
| 9 | C3H8 | 0.01% | 10.0% |
| 10 | i-C4H10 | 0.01% | 10.0% |
| 11 | n-C4H10 | 0.01% | 2.0% |
| 12 | i-C5H12 | 0.01% | 10.0% |
| 13 | n-C5H12 | 0.01% | 2.0% |
| 14 | H2S | 0.10% | 30.0% |
| 15 | C6+ | 0.01% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 23 minutes analysis for natural gas
- Dual TCD channels
- Calorific value software is available
- Good separation for He and $H_2$
- Good repeatability

## Typical Chromatograms

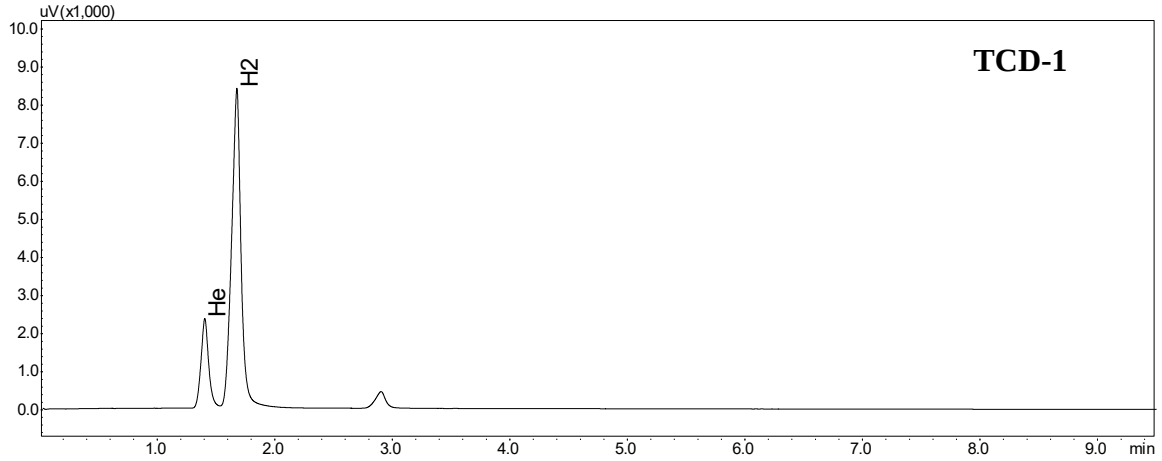


Fig. 1 Chromatogram of TCD-1

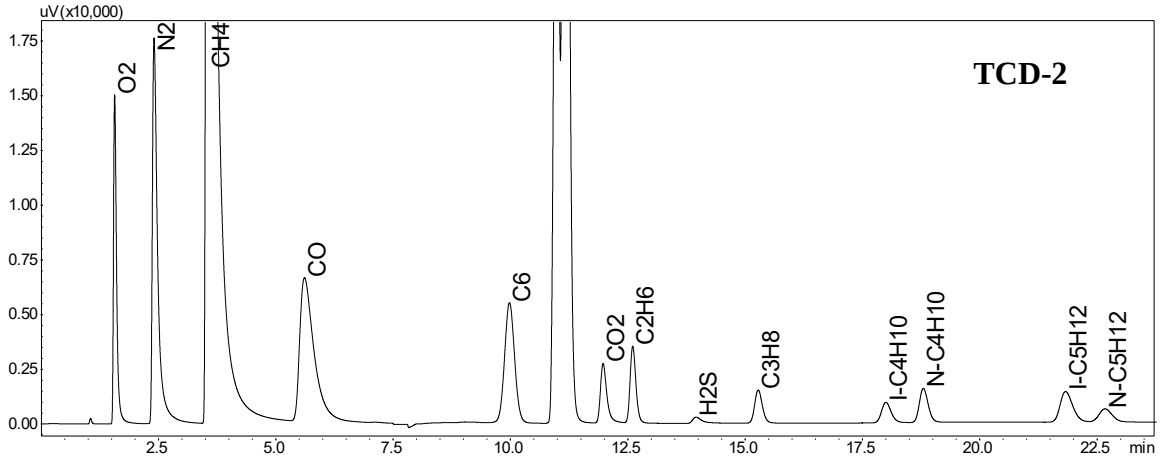


Fig. 2 Chromatogram of TCD-2

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No.2

# System Gas Chromatograph

# Natural Gas Analyzer
# Nexis GC-2030NGA2
# GC-2014NGA2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. It provides data for calculating a sample's physical properties, such as its heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. This analyzer uses a total of two valves and four columns. The sample is introduced into three sample loops for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows C3-C5, CO2, and C2H6 to be eluted to a TCD through a DC-200 column in that order. Finally, using MS-5A, O2, N2, CH4, and CO are separated and detected by the TCD. The run time is approximately 20 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Two valves / four packed columns with one TCD detector

**Sample Information:**
$O_2$, $N_2$, CO, $CO_2$, $H_2S$, $C_1$-$C_5$ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane ), $C_{6+}$ by backflush

**Methods met:**
ASTM-D1945, D3588

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.01% | 20.0% |
| 2 | N2 | 0.01% | 50.0% |
| 3 | CH4 | 20.0% | 100.0% |
| 4 | CO | 0.01% | 5.0% |
| 5 | CO2 | 0.01% | 20.0% |
| 6 | C2H6 | 0.01% | 10.0% |
| 7 | C3H8 | 0.01% | 10.0% |
| 8 | i-C4H10 | 0.01% | 10.0% |
| 9 | n-C4H10 | 0.01% | 10.0% |
| 10 | i-C5H12 | 0.01% | 2.0% |
| 11 | n-C5H12 | 0.01% | 2.0% |
| 12 | H2S | 0.10% | 30.0% |
| 13 | C6+ | 0.01% | 0.5% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 23 minutes analysis for natural gas
- Single TCD channel
- Calorific value software is available
- Second FID/TCD channel can be added for additional analyses

## Typical Chromatograms

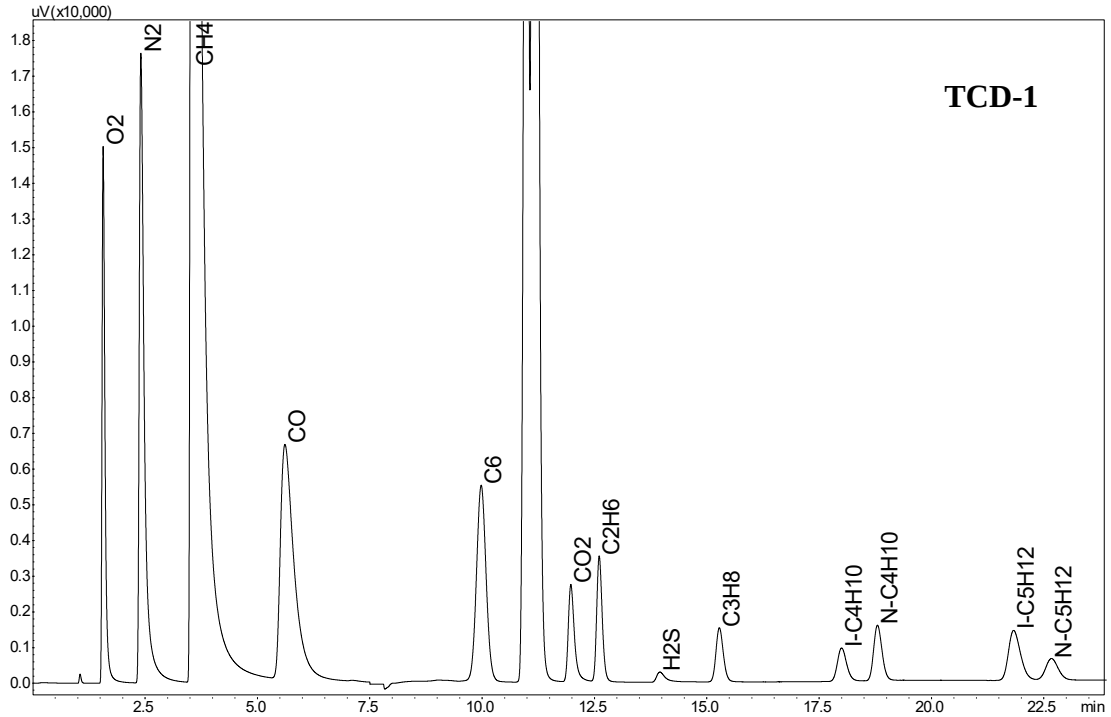


Fig. 1 Chromatogram of TCD-1

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No.55

# System Gas Chromatograph

# Hydrocarbon NGA/RGA Gas Analysis System
# Nexis GC-2030HNR1
# GC-2014HNR1

Return to Table

This method is for determining the hydrocarbons within the composition range shown in the specification sheet. A total of 1 valve and 3 columns are applied in this GC system. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C1 through C5 to be separated individually by a sebaconitrile packed column and detected by FID. The analysis time is approximately 30 minutes. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
One10-port valve / three packed columns with one FID detector

**Sample Information:**
C1-C6

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 0.010% | 80.0% | FID |
| 2 | C2H6 | 0.001% | 5.0% | FID |
| 3 | C3H8 | 0.001% | 5.0% | FID |
| 4 | C3H6 | 0.001% | 5.0% | FID |
| 5 | C2H2 | 0.001% | 5.0% | FID |
| 6 | i-C4H10 | 0.001% | 1.0% | FID |
| 7 | n-C4H10 | 0.001% | 1.0% | FID |
| 8 | Propadiene | 0.001% | 1.0% | FID |
| 9 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 10 | 1-C4H8 | 0.001% | 0.5% | FID |
| 11 | Cis-2-C4H8 | 0.001% | 0.5% | FID |
| 12 | i-C5H12 | 0.001% | 0.5% | FID |
| 13 | n-C5H12 | 0.001% | 0.5% | FID |
| 14 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 15 | C3H4 | 0.001% | 0.5% | FID |
| 16 | C6+ | 0.001% | 1.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

## Typical Chromatograms

Return to Table

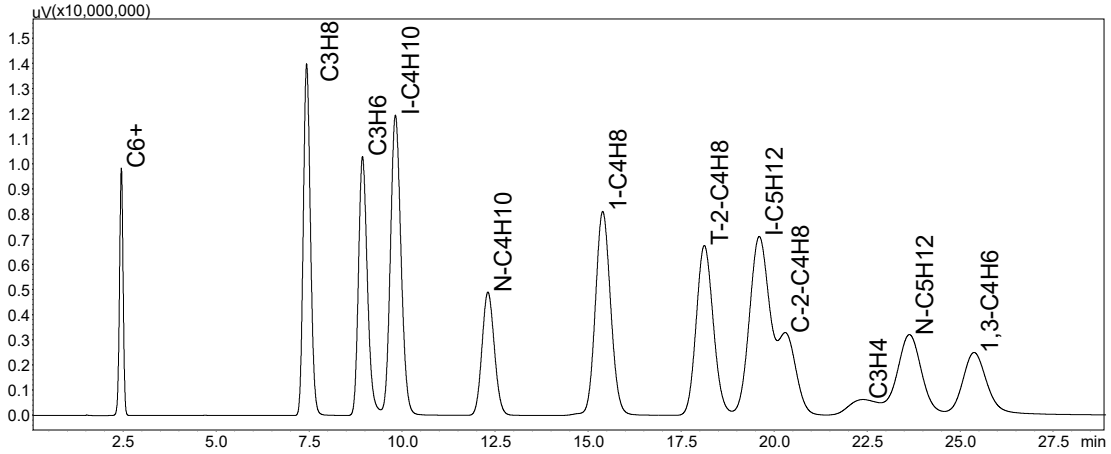


Fig. Chromatogram of FID

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No.56

# System Gas Chromatograph

# Hydrocarbon NGA/RGA Gas Analysis System
# Nexis GC-2030HNR2
# GC-2014HNR2

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 1 valve and 2 columns are usedin this GC system. Sample is introduced into four sample loops for introduction into the GC.. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through C5 to be separated individually through Alumina capillary column and to be detected by FID. The final analysis time is approximately 10 minutes. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One10-port valve / one packed and one capillary columns with one FID detector

**Sample Information:**
C1-C6

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 0.001% | 80.0% | FID |
| 2 | C2H4 | 0.001% | 10.0% | FID |
| 3 | C2H6 | 0.001% | 10.0% | FID |
| 4 | C2H2 | 0.001% | 10.0% | FID |
| 5 | C3H8 | 0.001% | 5.0% | FID |
| 6 | C3H6 | 0.001% | 5.0% | FID |
| 7 | i-C4H10 | 0.001% | 1.0% | FID |
| 8 | n-C4H10 | 0.001% | 1.0% | FID |
| 9 | Propadiene(C3H4) | 0.001% | 1.0% | FID |
| 10 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 11 | 1-C4H8 | 0.001% | 0.5% | FID |
| 12 | i-C4H8 | 0.001% | 0.5% | FID |
| 13 | Cis-2-C4H8 | 0.001% | 0.5% | FID |
| 14 | i-C5H12 | 0.001% | 0.5% | FID |
| 15 | n-C5H12 | 0.001% | 0.5% | FID |
| 16 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 17 | C3H4 | 0.001% | 0.5% | FID |
| 18 | C6+ | 0.001% | 1.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

Return to Table

## Typical Chromatograms

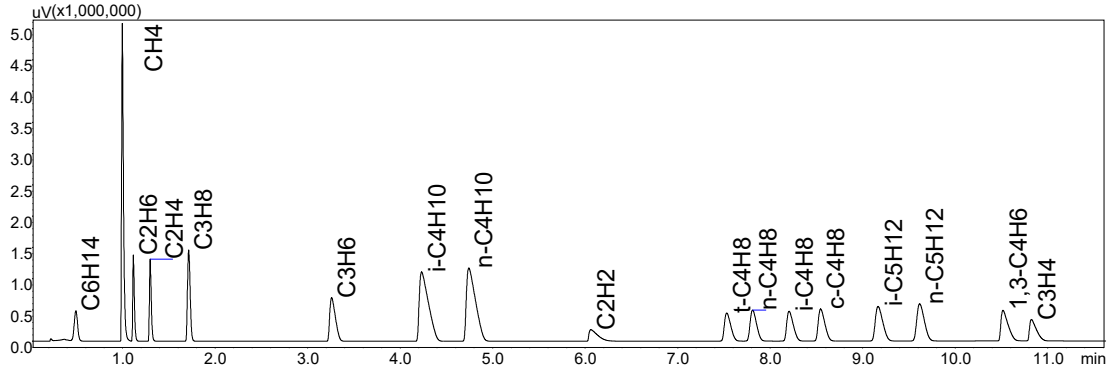


Fig. Chromatogram of FID

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No.60

# System Gas Chromatograph

# NGA Analysis with ISO6974-3 Nexis
# Nexis GC-2030ISO6974-3
# GC-2014ISO6974-3

Return to Table

This method is for determining the chemical composition of natural gases within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A MS-13X column with thermal conductivity detector (TCD-2) is used for the separation and detection of He, H2, O2, N2, CH4 and CO and the C2+ are back-flushed out by using Porapak-N as pre-column. Porapak-T column coupled with a TCD-1 and a flame ionization detector (FID) in series is used for the separation and detection of N2, CO2 and hydrocarbons from C1-C8. TCD-1 for component including hydrocarbons up to C3 and FID for hydrocarbons from C4 to C8. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
Two valves / three packed columns with two TCD detectors

**Sample Information:** Permanent gas, C1-C8

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | He | 0.01% | 0.5% | TCD-2 |
| 2 | H2 | 0.01% | 0.5% | TCD-2 |
| 3 | O2 | 0.1% | 0.5% | TCD-2 |
| 4 | N2 | 0.1% | 40.0% | TCD-2 |
| 5 | CH4 | 50.0% | 100% | TCD-2 |
| 6 | CO2 | 0.1% | 30.0% | TCD-1/FID |
| 7 | C2H6 | 0.1% | 15.0% | TCD-1/FID |
| 8 | C3H8 | 0.001% | 5.0% | TCD-1/FID |
| 9 | i-C4H10 | 0.0001% | 2.0% | FID |
| 10 | n-C4H10 | 0.0001% | 2.0% | FID |
| 11 | i-C5H12 | 0.0001% | 1.0% | FID |
| 12 | n-C5H12 | 0.0001% | 1.0% | FID |
| 13 | C6 – C8 | 0.0001% | 0.5% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- Two TCD channels
- Good repeatability

## Typical Chromatograms

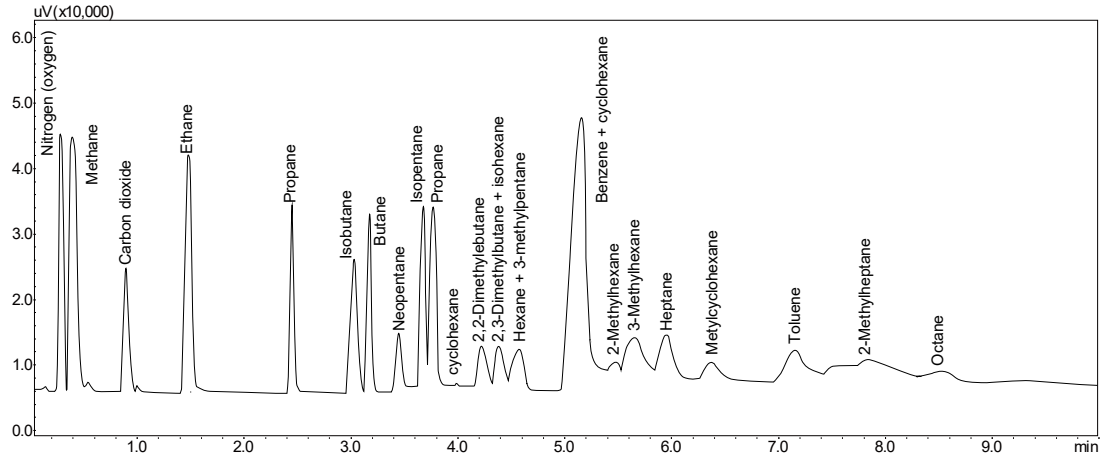


Fig. 1 Chromatogram of TCD

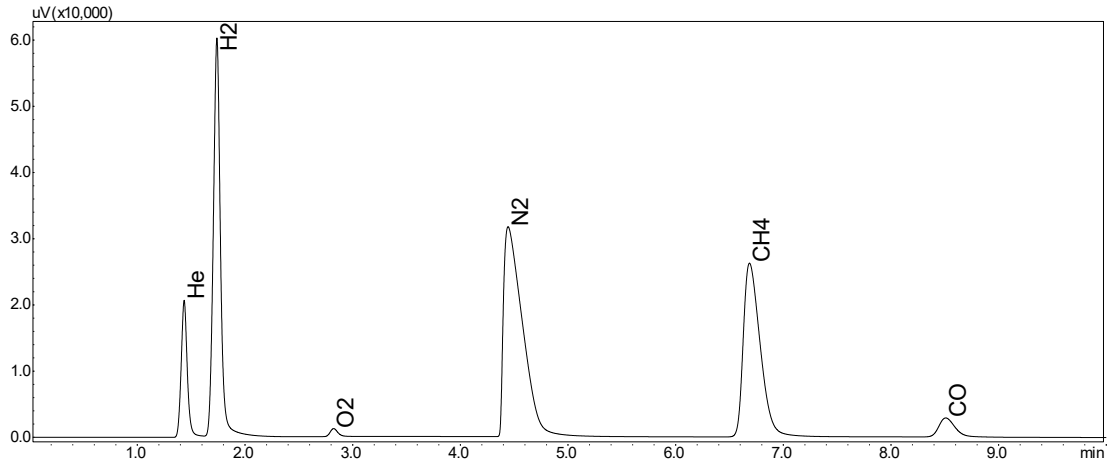


Fig. 2 Chromatogram of TCD

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No.61

# System Gas Chromatograph

# NGA analysis with ISO6974-4
# Nexis GC-2030ISO6974-4
# GC-2014ISO6974-4

Return to Table

This method is for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 1 valves and 2 columns are applied in this GC system. Sample is introduced into the sample loop for determination. Using a pre-column, C6+ components are back-flushed as a single peak. The valve timing then allows C1-C5, N2, CO2 to be eluted to TCD through DC-200 in that order. The final analysis time is approximately 22 minutes. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One valve / two packed columns with one TCD detector

**Sample Information:**
Permanent gas, C1-C6

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | N2 | 0.001% | 15.0% | TCD-1 |
| 2 | CH4 | 75.0% | 100.0% | TCD-1 |
| 3 | CO2 | 0.001% | 10.0% | TCD-1 |
| 4 | C2H6 | 0.001% | 10.0% | TCD-1 |
| 5 | C3H8 | 0.001% | 3.0% | TCD-1 |
| 6 | i-C4H10 | 0.001% | 1.0% | TCD-1 |
| 7 | n-C4H10 | 0.001% | 1.0% | TCD-1 |
| 8 | Neo-C5H12 | 0.001% | 0.5% | TCD-1 |
| 9 | i-C5H12 | 0.001% | 0.5% | TCD-1 |
| 10 | n-C5H12 | 0.001% | 0.5% | TCD-1 |
| 11 | C6+ | 0.001% | 0.2% | TCD-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One TCD channel
- Good repeatability

## Typical Chromatograms

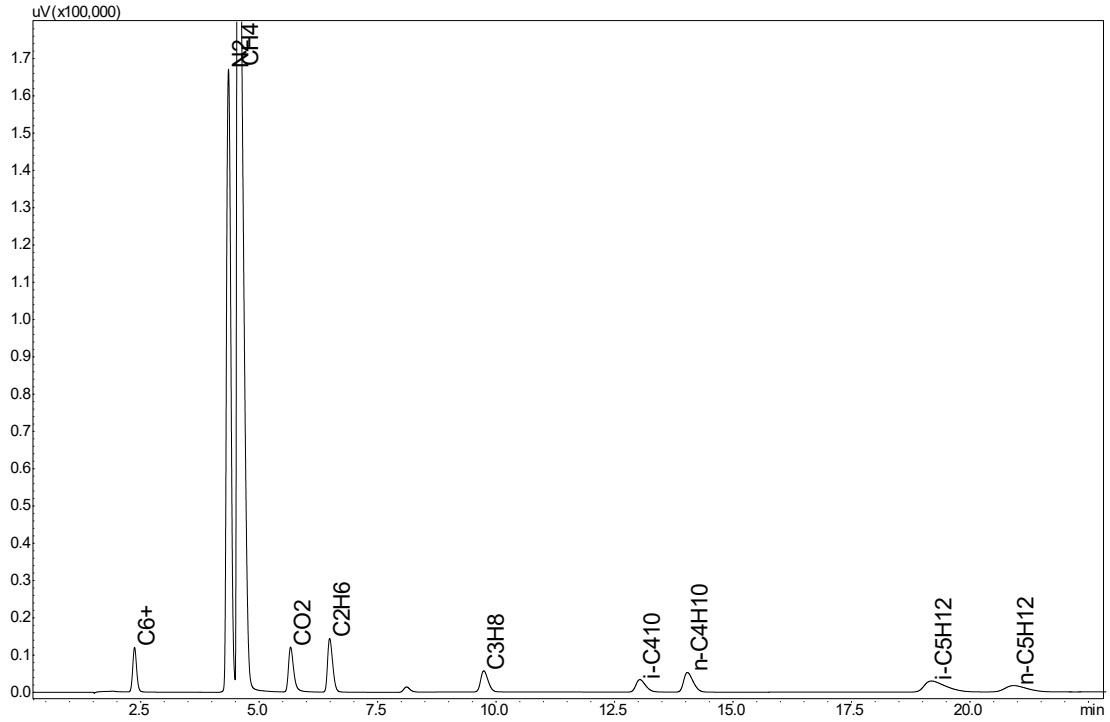


Fig. 2 Chromatogram of TCD

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# LPG Analysis System Lineup

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.

| LPG Analysis System Lineup | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| - | 10 ppm for hydrocarbon C1-C6 | FID | 15 minutes | **No. 47** |
| - | 10 ppm for hydrocarbon C1-C6 | FID | 15 minutes | **No. 48** |
| - | 0.1 ppm to 90% for C1-C5,0.1 ppm to 10% for Methanol,0.1 ppm to 10% for Ethanol | FID x2 | 11 minutes | **No. 41** |

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No.47

# System Gas Chromatograph

## Hydrocarbon Analysis with Vaporizer Device for LPG
## Nexis C-2030LPGHC1
## GC-2014LPGHC1

Return to Table

This method is for determination of the hydrocarbons in LPG. LPG is vaporized by an on-line vaporizer device. After vaporization of hydrocarbons, a gaseous sample moves to a fixed sample loop. The sample is measured by this loop and transferred to a split/splitless injector and separated by an Alumina capillary column and detected by FID.
The analysis time is approximately 30 minutes. The system includes LabSolutions GC workstation software.

**Analyzer Information**

**System Configuration:**
One valve / capillary column with FID detector

**Sample Information:**
Liquid permanent gas $C_1$-$C_6$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CH4 | 0.001% | 10.0% |
| 2 | C2H4 | 0.001% | 10.0% |
| 3 | C2H6 | 0.001% | 10.0% |
| 4 | C2H2 | 0.001% | 10.0% |
| 5 | C3H8 | 0.001% | 5.0% |
| 6 | C3H6 | 0.001% | 5.0% |
| 7 | i-C4H10 | 0.001% | 1.0% |
| 8 | n-C4H10 | 0.001% | 1.0% |
| 9 | Propadiene | 0.001% | 1.0% |
| 10 | Other C4 and C5 | 0.001% | 0.5% |
| 17 | C3H4 | 0.001% | 0.5% |
| 18 | C6H14 | 0.001% | 0.5% |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 15 minutes analysis for hydrocarbons analysis can be carried out
- Single FID channel
- LPG is vaporized by on-line vaporizer device

Return to Table

## Typical Chromatograms

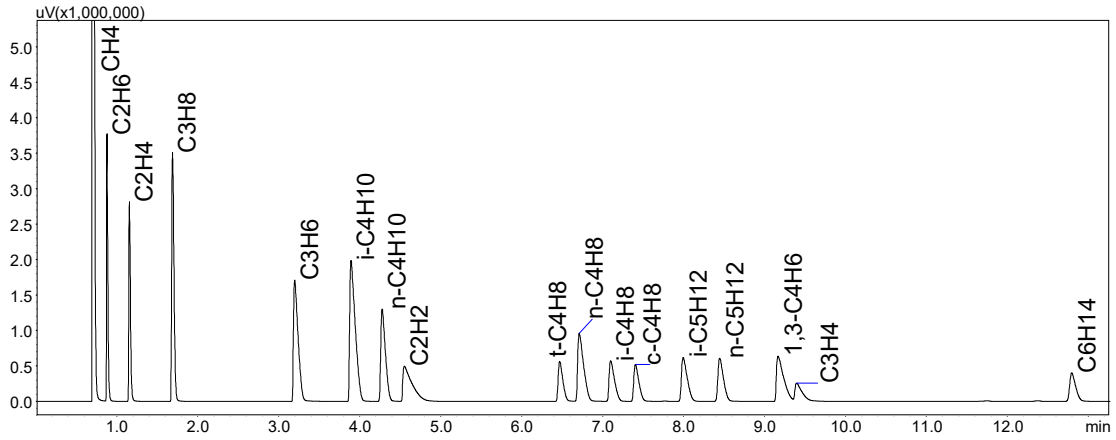


Fig. Chromatogram of FID

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No.48

# System Gas Chromatograph

## Hydrocarbon Analysis with Vaporizer Device for LPG
## Nexis C-2030LPGHC2
## GC-2014LPGHC2

Return to Table

This method is for determination of the hydrocarbons in LPG. LPG is vaporized by an on-line vaporizer device. After vaporization of hydrocarbons, a gaseous sample moves to a fixed sample loop. The sample is measured by this loop and transferred to a split/splitless injector and separated by an alumina capillary column and detected by FID.
The analysis time is approximately 30 minutes. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
One valve / capillary column with FID detector

**Sample Information:**
Liquid permanent gas $C_1$-$C_6$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 0.001% | 10.0% | FID |
| 2 | C2H4 | 0.001% | 10.0% | FID |
| 3 | C2H6 | 0.001% | 10.0% | FID |
| 4 | C2H2 | 0.001% | 10.0% | FID |
| 5 | C3H8 | 0.001% | 5.0% | FID |
| 6 | C3H6 | 0.001% | 5.0% | FID |
| 7 | i-C4H10 | 0.001% | 1.0% | FID |
| 8 | n-C4H10 | 0.001% | 1.0% | FID |
| 9 | Propadiene | 0.001% | 1.0% | FID |
| 10 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 11 | 1-C4H8 | 0.001% | 0.5% | FID |
| 12 | i-C4H8 | 0.001% | 0.5% | FID |
| 13 | cis-2-C4H8 | 0.001% | 0.5% | FID |
| 14 | i-C5H12 | 0.001% | 0.5% | FID |
| 15 | n-C5H10 | 0.001% | 0.5% | FID |
| 16 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 17 | C3H4 | 0.001% | 0.5% | FID |
| 18 | hexane | 0.001% | 0.5% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 15 minutes analysis for hydrocarbons analysis can be carried out
- Single FID channel with split/splitless injector
- Liquid sample is measured through internal sample loop in the liquid sampling device

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## Typical Chromatograms

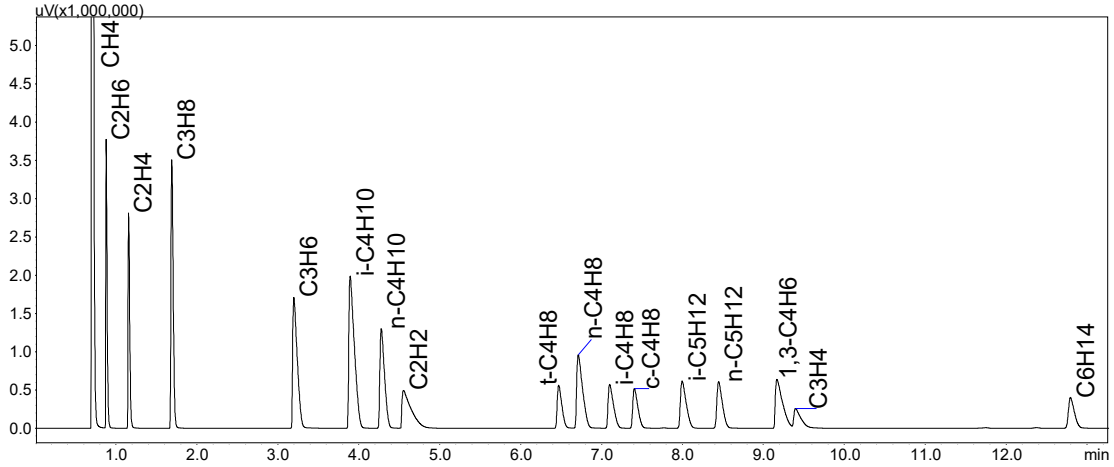


Fig. Chromatogram of FID

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No.41

# System Gas Chromatograph

## Methanol and Ethanol in LPG analysis system
## Nexis GC-2030DFC1
## GC-2014DFC1

Return to Table

This method uses a new micro column switching technique (2D-GC) to determine methanol and ethanol in LPG. The chemical composition range of LPG is shown in the table. Compared to traditional valve switching techniques, this test method with a digital APC switch is much easier and simpler. Only one Aux-APC and three columns are applied in this GC system. Using a pre-column, all the components are separated into two main parts; the first part is hydrocarbons, the second part is methanol and ethanol. When APC2 is ON and APC1 is OFF, the hydrocarbons pass through col-2 (Alumina capillary column), are separated, and detected by FID-2. Immediately before the second part of the compounds are eluted out of the pre-column, turn on APC1 and shut off APC2. The methanol and ethanol pass through col-2, are separated, and detected by FID-2. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
Three capillary column with two FID detectors

**Sample Information:**
C1~C5 ,Methanol,Ethanol

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | C1-C5 | 0.1ppm | 90.0% |
| 2 | MeOH | 0.1ppm | 10.0% |
| 3 | EtOH | 0.1ppm | 10.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

・11 minutes analysis can be carried out for all compounds
・Single channel with three capillary columns by using FID detector

### Typical Chromatograms

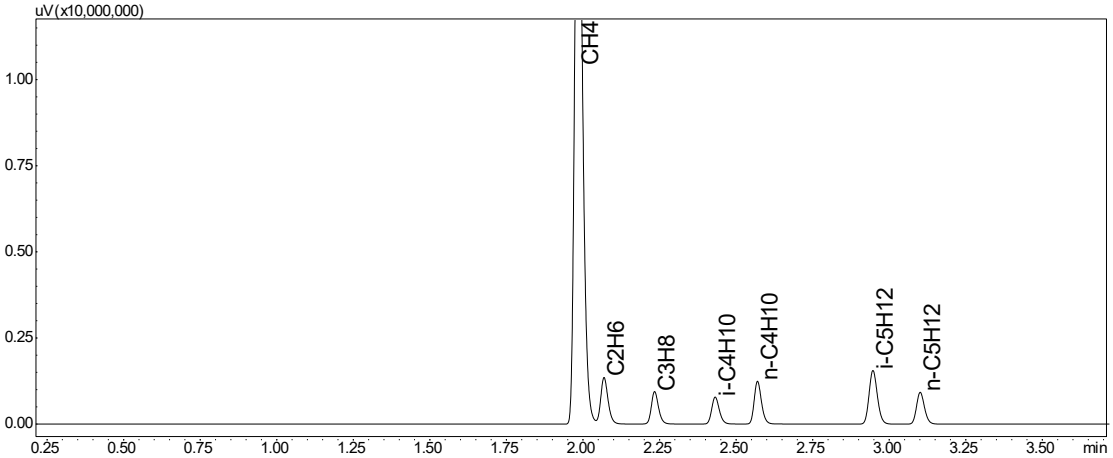


Fig. 1 Chromatogram of FID-1

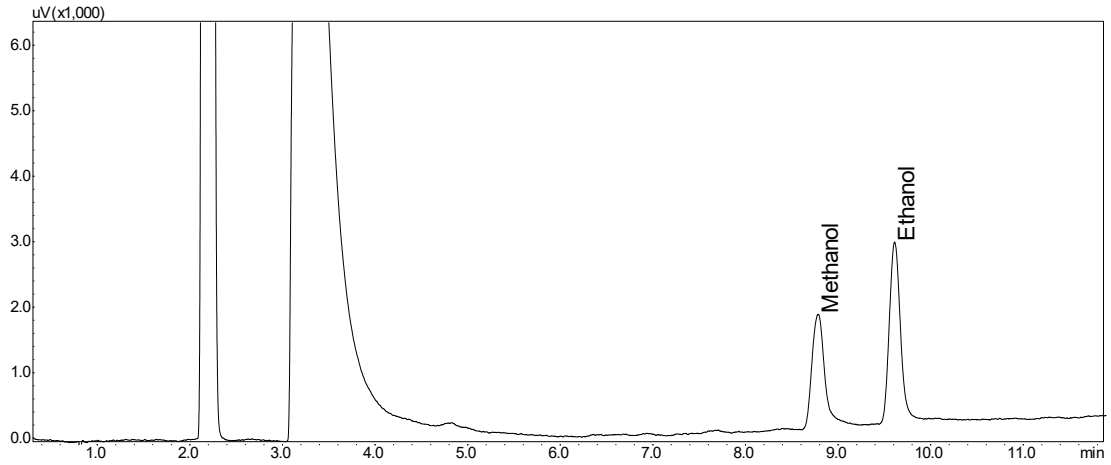


Fig. 2 Chromatogram of FID-2

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# Gasoline/Fuel Analysis

A gas chromatograph is used for composition analysis of gasoline and its additives in order to improve fuels' performance. In addition to excellent performance, Shimadzu's GC systems improve productivity. For example, the Nexis GC-2030 system combines three standards into one to save analytical instrument and labor costs.

| **RGA series lineup** | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D3606, ASTM-D4815, ASTM-D5580 | MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 alcohols in Gasoline | TCD,FID | 10, 30, 21, 40 mintues | **No. 50** |
| **Benzene and toluene analysis system** | | | | |
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D3606 | 0.1% to 5% for Benzene, 2% to 20% for Toluene | TCD | 9 minutes | **No. 22** |
| ASTM-D3606 | 10ppm to 5% for Benzene, 200ppm to 20% for Toluene | FID | 9 minutes | **No. 23** |
| ASTM-D3606 | 1 ppm to 1000 ppm for Benzene, 1 ppm to 1000 ppm for Toluene | FID | 4 minutes | **No. 26** |
| **Aromatic components analysis** | | | | |
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D5580 | 0.1 to 5% for Benzene, 1 to 15% for Toluene, 0.5 to 10% for C8 aromatics, 5 to 30% for total C9 and heavier aromatics | FID | 38 minutes | **No. 28** |
| **Aromatic components analysis** | | | | |
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D7423 | DME, Diethyl ether, Acetaldehyde, ETBE, MTBE, DIPE, Methanol, Acetone, MEK | FID | 20minutes | **No. 174** |
| UOP-960 | ETBE, MTBE, DIPE, Propionaldehyde, TAME, C1 to C5 alcohols in liquid hydrocarbon stream | FIDx2 | 35minutes | **No. 188** |
| ASTM-D4815 | MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 alcohols in gasoline | FID | 30minutes | **No. 30** |

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No.50

# System Gas Chromatograph

# Benzene Toluene and Aromatic Analysis
# Nexis GC-2030_3606-4815-5580_1

Return to Table

This system contains two analysis lines, one is for benzene, toluene analysis (ASTM-D3606), the other is for aromatic component analysis (ASTM-D5580). Flow diagram of ASTM-D4815 is exactly same as ASTM-D5580. So, this system can be used for oxygenate analysis as well.

[Benzene, toluene analysis]
An appropriate internal standard such as butanone is added to the gasoline sample which is then introduced into a gas chromatograph with two columns and a column switching valve. The sample first passes onto a non-polar pre-column (OV-1) which elutes components according to their boiling points. After the elution of isooctane, the valve is switched to back-flush those portions whose boiling points are higher than isooctane and vent them to the atmosphere. Isooctane and lighter portions are directed into the polar analysis column, while benzene and toluene are eluted through the polar column and detected by TCD.

[Aromatic component analysis]
A two column chromatographic system equipped with a column switching valve and a flame ionization detector is used. A reproducible volume of sample containing an appropriate internal standard such as 2-hexanone is injected onto a pre-column containing a polar liquid phase (TCEP). The C9 and lighter non-aromatics are vented to atmosphere as they elute from the pre-column. A thermal conductivity detector may be used to monitor this separation. The TCEP pre-column is back-flushed immediately before the elution of benzene, and the remaining portion of the sample is directed onto a second column containing a non-polar liquid phase (WCOT). Benzene and toluene, and the internal standard elute in the order of their boiling points and are detected by a flame ionization detector. Immediately after the elution of the internal standard, the flow through the non-polar WCOT column is reversed to back-flush the remainder of the sample (C8 and heavier aromatics plus C10 and heavier non-aromatics) from the column to the flame ionization detector. The analysis is repeated a second time allowing the C12 and lighter non-aromatics, benzene and toluene to elute from the polar TCEP pre-column to vent. A thermal conductivity detector may be used to monitor this separation. The TCEP pre-column is back-flushed immediately prior to the elute of ethylbenzene and the remaining aromatic portion is directed into the WCOT column. The internal standard and C8 aromatic components elute in the order of their boiling points and are detected by a flame ionization detector. Immediately after o-xylene has eluted, the flow through the non-polar WCOT column is reversed to back-flush the C9 and heavier aromatics to the flame ionization detector. From the first analysis, the peak areas of benzene, toluene, and the internal standard (2-hexanone) are measured and recorded. Peak areas for ethylbenzene, p/m-xylene, o-xylene, the C9 and heavier aromatics, and internal standard are measured and recorded from the second analysis. The back-flush peak eluting from the WCOT column in the second analysis contains only C9 and heavier aromatics. The flame ionization detector response, proportional to the concentration of each component, is used to calculate the amount of aromatics that present with reference to the internal standard.

[Oxygenates analysis]
An appropriate internal standard such as 1,2-dimethoxyethane (ethylene glycol dimethyl ether) is added to the sample which is then introduced into a gas chromatograph equipped with two columns and a column switching valve. The sample first passes onto a polar TCEP column which elutes lighter hydrocarbons to vent and retains the oxygenated and heavier hydrocarbons. After methycyclopentane, but before DIPE and MTBE elute from the polar column, the valve is switched to back-flush the oxygenates onto a WCOT non-polar column. The alcohols and ethers elute from the non-polar column in boiling point order, before elution of any major hydrocarbon constituents. After benzene and TAME elute from the non-polar column, the column switching valve is switched back to its original position to back-flush the heavy hydrocarbons. The eluted components are detected by a flame ionization or thermal conductivity detector. The detector response, proportional to the component concentration, is recorded; the peak areas are measured; and the concentration of each component is calculated with reference to internal standard. The system includes Lab Solutions GC workstation software.

Return to Table

## Analyzer Information

**System Configuration:**
Two valves / packed and capillary columns with TCD/ FID detectors

**Sample Information:**
Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C4 alcohols in Gasoline

**Methods met:**
ASTM-D3606, D4815, D5580

**Target Compound Table for Benzene Toluene**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 0.1% | 5.0% |
| 2 | Toluene | 1.0% | 15.0% |
| 3 | C8 aromatics | 0.5% | 10.0% |

**Target Compound Table for Aromatic Components**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | ethers | 0.1% | 20.0% |
| 2 | alcohols | 0.1% | 12.0% |

**Target Compound Table for Oxygenate**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 0.1% | 5.0% |
| 2 | Toluene | 2.0% | 20.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual channel system meets ASTM D3606, D4815, D5580
- 10-port valve is used for ASTM D4815, D5580 with FID detector
- 6-port valve is used for ASTM D3606 with TCD detector

## Typical Chromatograms

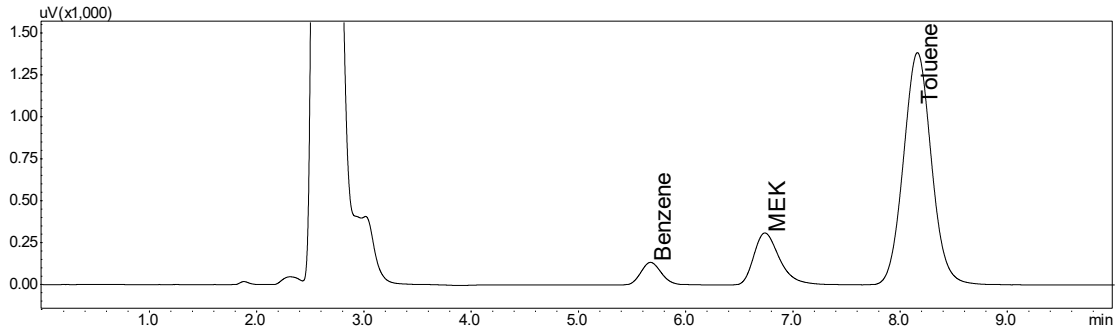


Fig. 1 Chromatogram - ASTM D3606

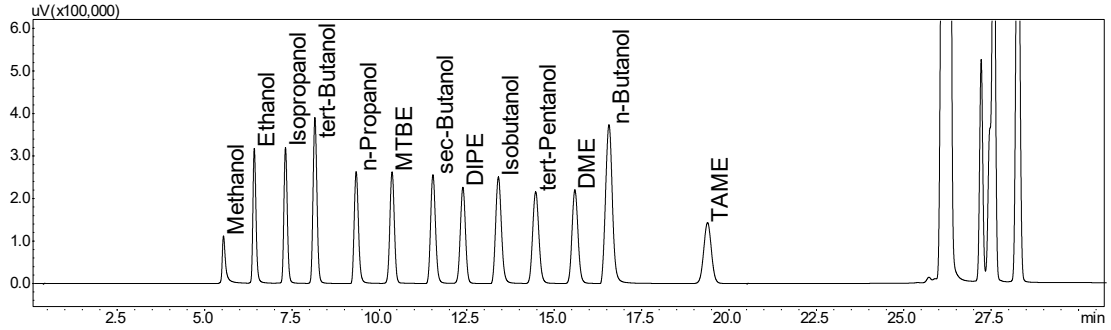


Fig. 2 Chromatogram - ASTM D4815

Return to Table

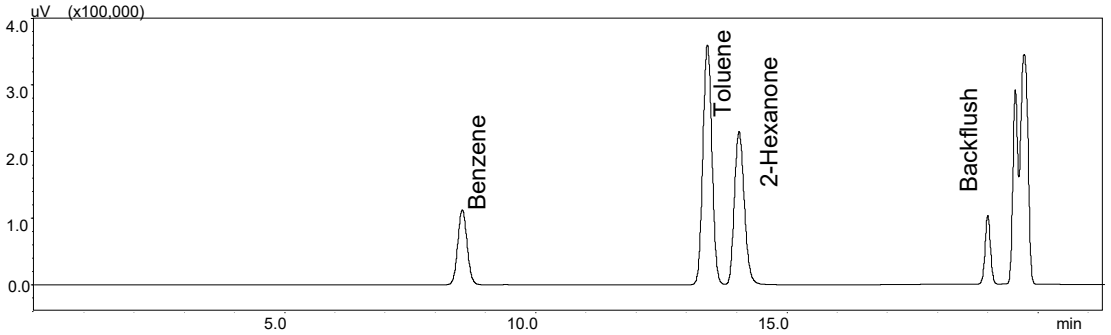


Fig. 3 Chromatogram - ASTM D5580-1

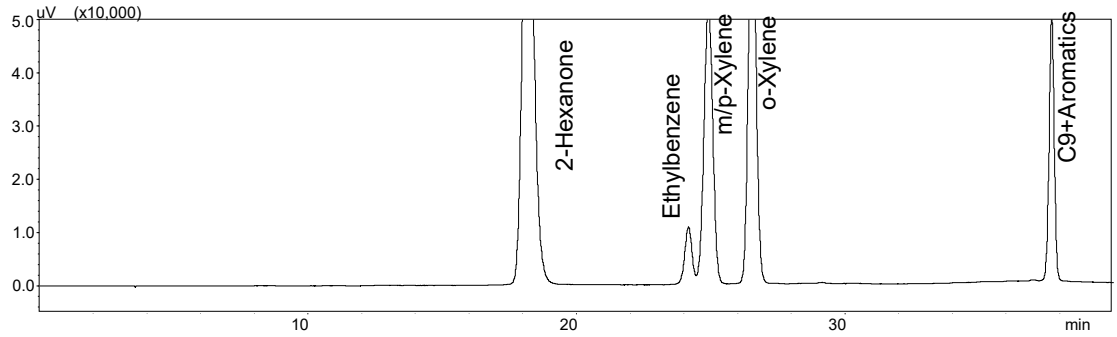


Fig. 4 Chromatogram - ASTM D5580-2

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No.22

## System Gas Chromatograph

# Benzene Toluene Analysis Nexis GC-2030BTA1

Return to Table

An appropriate internal standard such as butanone is added to the gasoline sample, which is then introduced into a gas chromatograph equipped with two columns and a column switching valve. The sample first passes through a non-polar pre-column (OV-1) that elutes components according to their boiling points. After the elution of isooctane, the valve is switched to back-flush the compounds whose boiling points are higher than isooctane and vent them to the atmosphere. Isooctane and lighter portions are directed into the polar column and elute quickly without separation while benzene and toluene are eluted through the polar column, separated and detected by TCD. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
One valve / two packed columns with one TCD detector

**Sample Information:**
Benzene, Toluene in Gasoline

**Methods met:**
ASTM-D3606

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 0.1% | 5.0% |
| 2 | Toluene | 2.0% | 20.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- 9 minutes analysis for gasoline analysis can be carried out
- Single TCD channel with dual packed column
- 6-port valve is used for the column switching to vent out the heavy hydrocarbons

### Typical Chromatograms

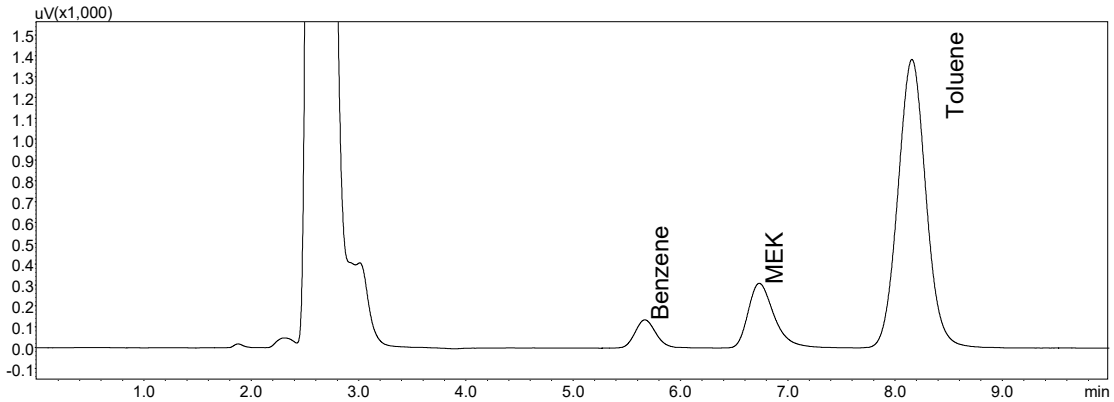


Fig. 1 Chromatogram of TCD

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No.23

System Gas Chromatograph

# Benzene Toluene Analysis Nexis GC-2030BTA2

Return to Table

An appropriate internal standard such as butanone is added to the gasoline sample, which is then introduced into a gas chromatograph equipped with two columns and a column switching valve. The sample first passes through a non-polar pre-column (OV-1) that elutes components according to their boiling points. After the elution of isooctane, the valve is switched to back-flush the compounds whose boiling points are higher than isooctane and vent them to the atmosphere. Isooctane and lighter portions are directed into the polar column and elute quickly without separation while benzene and toluene are eluted through the polar column, separated and detected by TCD. The system includes Lab Solutions GC workstation software.

## Analyzer Information

**System Configuration:**
One valve / two packed columns with one FID detector

**Sample Information:**
Benzene, Toluene in Gasoline

**Methods met:**
ASTM-D3606

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 0.001% | 5% |
| 2 | Toluene | 0.020% | 20% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 9 minutes analysis for gasoline analysis can be carried out
- Single channel with dual packed column by using FID detector
- Sample elutes from non-polar pre-column according to boiling point and heavy hydrocarbons are backflushed.

## Typical Chromatograms

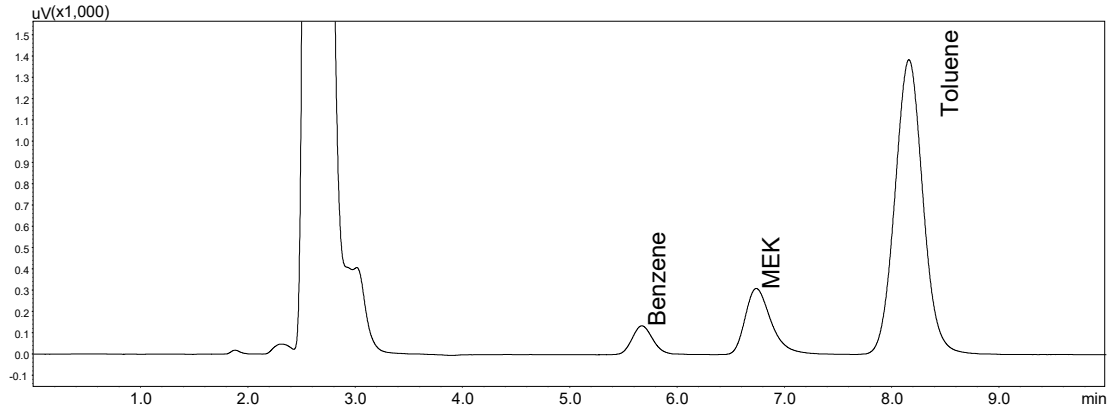


Fig. 1 Chromatogram of FID

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# System Gas Chromatograph

# Fast Benzene Toluene Analysis Nexis GC-2030FBTA1

Return to Table

An appropriate internal standard such as butanone is added to the gasoline sample, which is then introduced into a gas chromatograph equipped with two columns and two advanced pressure controls (APCs). The sample first passes through a non-polar pre-column (OV-1) that elutes components according to their boiling points. After the elution of isooctane, by changing the pressure of APCs, the pre-column is back-flushed to elute those portions whose boiling points are higher than isooctane and vent them to the atmosphere. Isooctane and lighter portions are directed into the polar column and elute quickly without separation while benzene and toluene are eluted through the polar column and detected by FID. Since capillary columns are employed, this system achieves fast analysis. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
One valve / two capillary columns with one FID detector

**Sample Information:**
Benzene, Toluene in Gasoline

**Methods met:**
ASTM-D3606

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 1ppm | 1000ppm |
| 2 | Toluene | 1ppm | 1000ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 4 minutes analysis for gasoline analysis
- High sensitivity FID
- Using advanced pressure control (APC) for backflushing heavy hydrocarbons without valves
- Good repeatability

## Typical Chromatograms

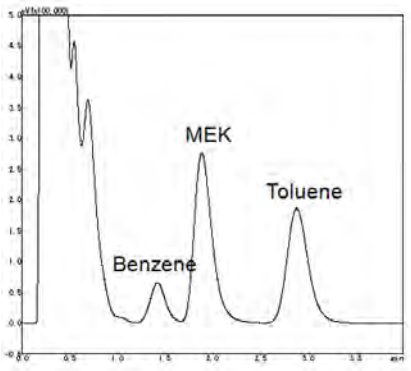


Fig. 1 Chromatogram of FID

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No.28

## System Gas Chromatograph

# Aromatic Component Analysis Nexis GC-2030ACA1

Return to Table

A two-column chromatographic system equipped with a column switching valve and a flame ionization detector is used. A reproducible volume of sample containing an appropriate internal standard, such as 2-hexanone, is injected into a pre-column containing a polar liquid phase (TCEP). The C9 and lighter non-aromatics are vented to atmosphere as they elute from the pre-column. A thermal conductivity detector may be used to monitor this separation. The TCEP pre-column is back-flushed immediately before the elution of benzene, and the remaining portion of the sample is directed into a second column containing a non-polar liquid phase (WCOT). Benzene, toluene, and the internal standard elute in the order of their boiling points and are detected by a flame ionization detector. Immediately after the elution of the internal standard, the flow through the non-polar WCOT column is reversed to back-flush the remainder of the sample (C8 and heavier aromatics plus C10 and heavier non-aromatics) from the column to the flame ionization detector. The analysis is repeated a second time allowing the C12 and lighter non-aromatics, benzene and toluene to elute from the polar TCEP pre-column to vent. A thermal conductivity detector may be used to monitor this separation. The TCEP pre-column is back-flushed immediately prior to the elution of ethylbenzene, and the remaining aromatic portion is directed into the WCOT column. The internal standard and C8 aromatic components elute in the order of their boiling points and are detected by FID. Immediately after o-xylene has eluted, the flow through the non-polar WCOT column is reversed to back-flush the C9 and heavier aromatics to the flame ionization detector.
From the first analysis, the peak areas of benzene, toluene, and the internal standard (2-hexanone) are measured and recorded. Peak areas for ethylbenzene, p/m-xylene, o-xylene, the C9 and heavier aromatics, and internal standard are measured and recorded from the second analysis. The back-flush peak eluting from the WCOT column in the second analysis contains only C9 and heavier aromatics. The flame ionization detector response, proportional to the concentration of each component, is used to calculate the amount of aromatics that are present with reference to the internal standard. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
One valve / packed and capillary columns with one FID detector

**Sample Information:**
Benzene, Toluene, Total $C_8$ and $C_9$ aromatics in Gasoline

**Methods met:**
ASTM-D5580

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 0.1% | 5.0% |
| 2 | Toluene | 1.0% | 15.0% |
| 3 | C8 aromatics | 0.5% | 10.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Using high sensitivity FID with single channel
- The first analysis: Benzene, Toluene and 2-Hexanone (internal standard) are measured and recorded
- The second analysis: 2-Hexanone, Ethylbenzene, p/m-Xylene, o-Xylene and C9+ aromatics are measured and recorded

## Typical Chromatograms

Return to Table

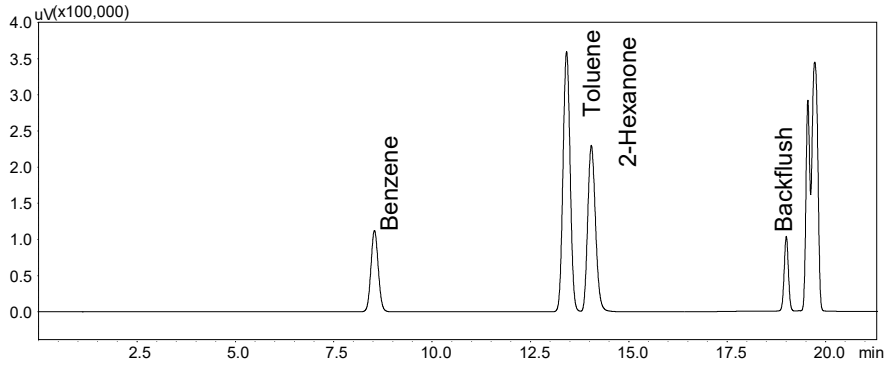


Fig. 1 Chromatogram of FID-1

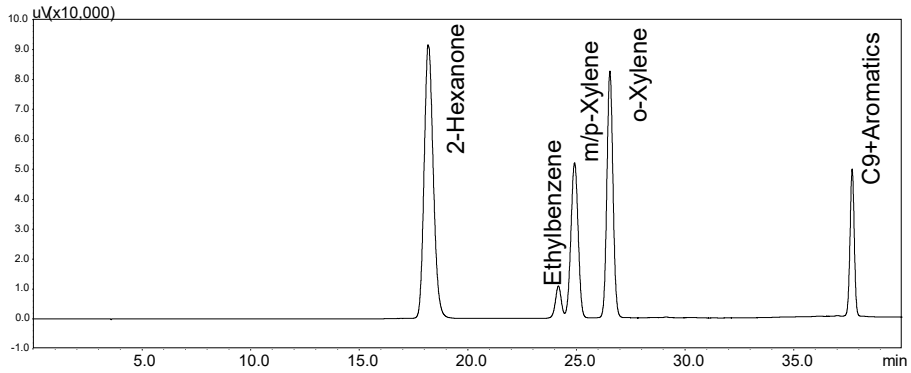


Fig. 2 Chromatogram of FID-1

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No.174

System Gas Chromatograph

# Oxygenates in Hydrocarbons
# Nexis GC-2030OXY2
# GC-2014OXY2

These method are for determining oxygenates in lighter hydrocarbons up to C5. Non-oxygenate compounds are vented by back-flushing, then oxygenates are separated and introduced into FID.

Return to Table

## Analyzer Information

**System Configuration:**
One valve and one SPL Injector / two capillary columns / one FID

**Sample Information:**
Oxygenates in C5 or lighter hydrocarbons matrix

**Methods met:**
ASTM-D7423

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | DME | 0.5 ppm | 100 ppm |
| 2 | Diethyl ether | 0.5 ppm | 100 ppm |
| 3 | Acetaldehyde | 0.5 ppm | 100 ppm |
| 4 | ETBE | 0.5 ppm | 100 ppm |
| 5 | MTBE | 0.5 ppm | 100 ppm |
| 6 | DIPE | 0.5 ppm | 100 ppm |
| 7 | Methanol | 0.5 ppm | 100 ppm |
| 8 | Acetone | 0.5 ppm | 100 ppm |
| 9 | MEK | 0.5 ppm | 100 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability
- Inert-treated flow path to prevent absorbent
- Gas sampling / LPG sampling devices can be used (optional)

## Typical Chromatograms

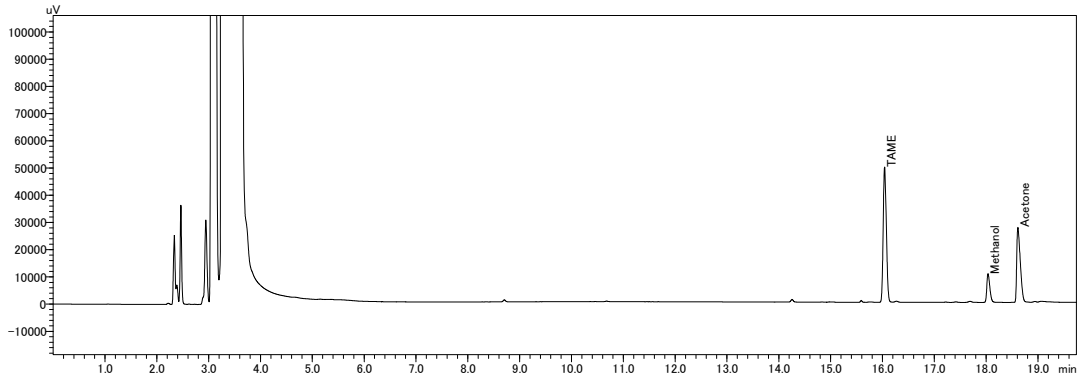


Fig. 1 Chromatogram of FID

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No.188

# System Gas Chromatograph

## Trace Oxygenated Hydrocarbons in Liquid Hydrocarbon Streams
## Nexis GC-2030OAS3
## GC-2014OAS3

Return to Table

This method is for determining trace oxygenated hydrocarbons in C4 liquefied petroleum gas (LPG) as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic sampling and backflush technique in multiple columns.

### Analyzer Information

**System Configuration:**
Two valves two SPL injectors / two capillary columns / two FID

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Methyl Ether | 1ppm | 100,000ppm |
| 2 | Ethyl Methyl Ether | 1ppm | 100,000ppm |
| 3 | Ethyl Ether | 1ppm | 100,000ppm |
| 4 | Acetaldehyde | 1ppm | 100,000ppm |
| 5 | Methyl Formate | 1ppm | 100,000ppm |
| 6 | tert-Butyl Ethyl Ether | 1ppm | 100,000ppm |
| 7 | tert-Butyl Methyl Ether | 1ppm | 100,000ppm |
| 8 | Isopropyl Ether | 1ppm | 100,000ppm |
| 9 | Propylene Oxide | 1ppm | 100,000ppm |
| 10 | sec-Butyl Methyl Ether | 1ppm | 100,000ppm |
| 11 | Propionaldehyde | 1ppm | 100,000ppm |
| 12 | Butyl Methyl Ether | 1ppm | 100,000ppm |
| 13 | tert-Amyl Methyl Ether | 1ppm | 100,000ppm |
| 14 | n-Propyl Ether | 1ppm | 100,000ppm |
| 15 | Butyl Ethyl Ether | 1ppm | 100,000ppm |
| 16 | Isobutyraldehyde | 1ppm | 100,000ppm |
| 17 | Tetrahydrofuran | 1ppm | 100,000ppm |
| 18 | n-Butyraldehyde | 1ppm | 100,000ppm |
| 19 | Methyl Acetate | 1ppm | 100,000ppm |
| 20 | Tetrahydropyran | 1ppm | 100,000ppm |
| 21 | Trimethylacetaldehyde | 1ppm | 100,000ppm |
| 22 | Methanol | 1ppm | 100,000ppm |
| 23 | Acetone | 1ppm | 100,000ppm |
| 24 | 2-Methylbutyraldehyde | 1ppm | 100,000ppm |
| 25 | Isovaleraldehyde | 1ppm | 100,000ppm |
| 26 | Cyclobutanone | 1ppm | 100,000ppm |
| 27 | Methyl Propionate | 1ppm | 100,000ppm |
| 28 | n-Valeraldehyde | 1ppm | 100,000ppm |
| 29 | 2-Butanone | 1ppm | 100,000ppm |
| 30 | Ethanol | 1ppm | 100,000ppm |

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 31 | 2-Ethylbutyraldehyde | 1ppm | 100,000ppm |
| 32 | 3,3-Dimethylbutyraldehyde | 1ppm | 100,000ppm |
| 33 | 2-Methylvaleraldehyde | 1ppm | 100,000ppm |
| 34 | Methyl Butyrate | 1ppm | 100,000ppm |
| 35 | 1,4-Dioxane | 1ppm | 100,000ppm |
| 36 | Hexanal | 1ppm | 100,000ppm |
| 37 | 3-Pentanone | 1ppm | 100,000ppm |
| 38 | 3,3-Dimethyl-2-butanone | 1ppm | 100,000ppm |
| 39 | 2-Pentanone | 1ppm | 100,000ppm |
| 40 | Isopropanol | 1ppm | 100,000ppm |
| 41 | n-Propanol | 1ppm | 100,000ppm |
| 42 | Cyclopropyl Methyl Ketone | 1ppm | 100,000ppm |
| 43 | 2-Methyl-3-pentanone | 1ppm | 100,000ppm |
| 44 | 3-Methyl-2-pentanone | 1ppm | 100,000ppm |
| 45 | Cyclopentanone | 1ppm | 100,000ppm |
| 46 | 4-Methyl-2-pentanone | 1ppm | 100,000ppm |
| 47 | 3-Hexanone | 1ppm | 100,000ppm |
| 48 | Isobutanol | 1ppm | 100,000ppm |
| 49 | tert-Butanol | 1ppm | 100,000ppm |
| 50 | sec-Butanol | 1ppm | 100,000ppm |
| 51 | Cyclobutanol | 1ppm | 100,000ppm |
| 52 | 2-Hexanone | 1ppm | 100,000ppm |
| 53 | n-Butanol | 1ppm | 100,000ppm |
| 54 | 3-Methyl-2-butanol | 1ppm | 100,000ppm |
| 55 | Neopentyl Alcohol | 1ppm | 100,000ppm |
| 56 | 3-Pentanol | 1ppm | 100,000ppm |
| 57 | tert-Amyl Alcohol | 1ppm | 100,000ppm |
| 58 | 2-Methyl-1-butanol | 1ppm | 100,000ppm |
| 59 | Cyclopentanol | 1ppm | 100,000ppm |
| 60 | 2-Pentanol | 1ppm | 100,000ppm |
| 61 | 3-Methyl-1-butanol | 1ppm | 100,000ppm |
| 62 | 1-Pentanol | 1ppm | 100,000ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

**Methods met:**
UOP-960

## System Features

- Dual FID channels (One is for detection of target compounds The other one is for checking backflush timing)
- Good repeatability

## Typical Chromatograms

Return to Table

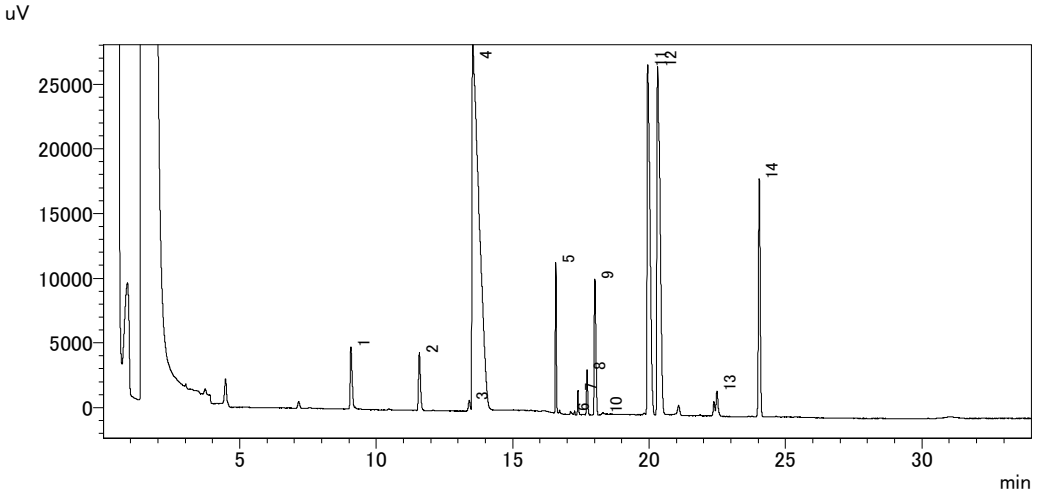


Fig. 1 Chromatogram of FID

| ID# | Name |
|---|---|
| 1 | Methyl ether |
| 2 | Ethyl methyl ether |
| 3 | Ethyl ether |
| 4 | Acetaldehyde |
| 5 | Propionaldehyde |
| 6 | Isobutyraldehyde |
| 7 | n-Butyraldehyde |
| 8 | Methanol |
| 9 | Acetone |
| 10 | 2-Methylbutyraldehyde |
| 11 | 2-Butanone |
| 12 | Ethanol |
| 13 | Isopropanol + n-Propanol + Cyclopropyl methyl ketone |
| 14 | Isobutanol + tert-Butanol + sec-Butanol |

Fig. 2 Compound List of The Chromatogram

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No.30

# System Gas Chromatograph

# Oxygenate Analysis
# Nexis GC-2030OAS1

Return to Table

An appropriate internal standard such as 1,2-dimethoxyethane (ethylene glycol dimethyl ether) is added to the sample, which is then introduced into a gas chromatograph equipped with two columns and a column switching valve. The sample first passes into a polar TCEP column that elutes lighter hydrocarbons to vent and retains the oxygenated and heavier hydrocarbons. After methylcyclopentane, but before DIPE and MTBE elute from the polar column, the valve is switched to back-flush the oxygenates into a WCOT non-polar column. The alcohols and ethers elute from the non-polar column in boiling point order, before elution of any major hydrocarbon constituents. After benzene and TAME elute from the non-polar column, the column switching valve is switched back to its original position to back-flush the heavy hydrocarbons. The eluted components are detected by a flame ionization or thermal conductivity detector. The detector response, proportional to the component concentration, is recorded, the peak areas measured, and the concentration of each component calculated with reference to the internal standard. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
One valve / packed and capillary columns with one FID detector

**Sample Information:**
Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and $C_1$ to $C_4$ alcohols in Gasoline

**Methods met:**
ASTM-D4815

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Ethers | 0.1% | 20.0% |
| 2 | Alcohols | 0.1% | 12.0% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Using high sensitivity FID with single channel
- Lighter hydrocarbons are eluted from polar TCEP column to vent and retain the oxygenate and heavier hydrocarbons
- Good separation of alcohols and ethers with non-polar column in boiling point order
- The eluted components are detected by FID or TCD detector

## Typical Chromatograms

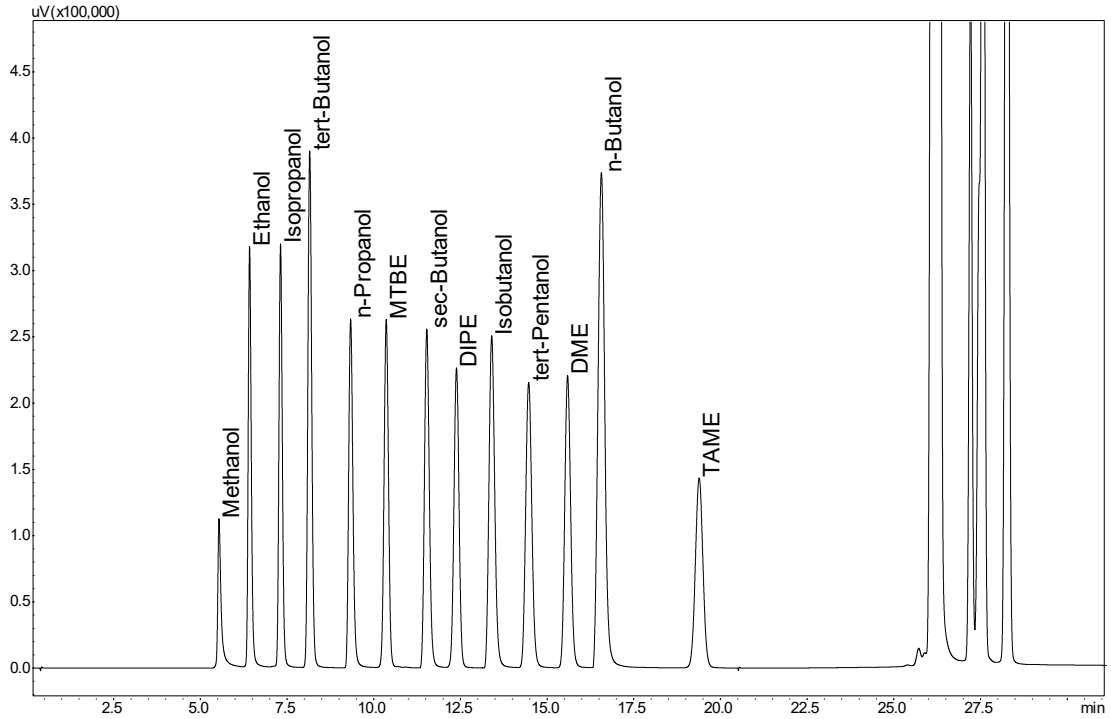


Fig. 1 Chromatogram of FID

Return to Table

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# Detailed Hydrocarbon Analysis (DHA)

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) according to ASTM-D6730. PONA analyte identification is conducted by matching retention indices with normal hydrocarbon paraffins. However, chromatograms obtained in PONA analyses have an extremely large number of peaks and their analytes may be mislabeled. Without accurate and reproducible retention indices, this may result in erroneous PONA ratios. The GC-2030 incorporates an Advanced Flow Controller that enables highly precise flow control, and makes it easy to analyze and identify detailed hydrocarbons. Shimadzu offers DHA analysis conforming to the following methods: ASTM-D5134, ASTM-D6729, ASTM-D6730, and ASTM-D6733

| **RGA series lineup** | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D5134 | Naphtha | FID | 120 minutes | **No. 173** |

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Application Data Sheet

No.173

System Gas Chromatograph

# Detailed Hydrocarbon Analysis of Naphtha Nexis GC-2030PONA2

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A representative sample of the Naphtha in introduced into a gas chromatogram equipped with a methyl silicone bonded phase fused silica capillary column. Helium carrier gas transports the vaporized sample through the column in which the components are separated. Components are sensed by a FID as they elute from the column. Each eluting peak is identified and by comparing its retention index to a table of retention indices and by visual matching with a standard chromatogram. The mass concentration of each component is determined by area normalization with response factors. Peaks eluting after n-nonane are summed and reports as $C_{10}^{+}$.

## Analyzer Information

**System Configuration:**
One SPL Injector / one capillary column / one FID

**Sample Information:**

Methane
Ethane
Propane
Isobutane
n-Butane
Neopentane
Isopentane
n-Pentane
2,2-Dimethylbutane
Cyclopentane
2,3-Dimethylbutane
2-Methylpentane
3-Methylpentane
n-Hexane
2,2-Dimethylpentane
Methylcyclopentane
2,4-Dimethylpentane
2,2,3-Trimethylbutane
Benzene
3,3-dimethylpentane
Cyclohexane
2-Methylhexane
2,3-Dimethylpentane
1,1-Dimethylcyclopentane
3-Methylhexane

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Methane | 100 ppm | - |
| 2 | Ethane | 100 ppm | - |
| 3 | Propane | 100 ppm | - |
| 4 | Isobutane | 100 ppm | - |
| 5 | n-Butane | 100 ppm | - |
| 6 | Neopentane | 100 ppm | - |
| 7 | Isopentane | 100 ppm | - |
| 8 | n-Pentane | 100 ppm | - |
| 9 | 2,2-Dimethylbutane | 100 ppm | - |
| 10 | Cyclopentane | 100 ppm | - |
| 11 | 2,3-Dimethylbutane | 100 ppm | - |
| 12 | 2-Methylpentane | 100 ppm | - |
| 13 | 3-Methylpentane | 100 ppm | - |
| 14 | n-Hexane | 100 ppm | - |
| 15 | 2,2-Dimethylpentane | 100 ppm | - |
| 16 | Methylcyclopentane | 100 ppm | - |
| 17 | 2,4-Dimethylpentane | 100 ppm | - |
| 18 | 2,2,3-Trimethylbutane | 100 ppm | - |
| 19 | Benzene | 100 ppm | - |
| 20 | 3,3-dimethylpentane | 100 ppm | - |
| 21 | Cyclohexane | 100 ppm | - |
| 22 | 2-Methylhexane | 100 ppm | - |
| 23 | 2,3-Dimethylpentane | 100 ppm | - |
| 24 | 1,1-Dimethylcyclopentane | 100 ppm | - |
| 25 | 3-Methylhexane | 100 ppm | - |

**Sample Information:**

cis-1,3-Dimethylcyclopentane
trans-1,3-Dimethylcyclopentane
3-Ethylpentane
trans-1,2-Dimethylcyclopentane
2,2,4-Trimethylpentane
n-Heptane
Methylcyclohexane + cis-1,2-Dimethylcyclopentane
1,1,3-Trimethylcyclopentane + 2,2-Dimethylhexane
Ethylcyclopentane
2,5-Dimethylhexane + 2,2,3-Trimethylpentane
2,4-Dimethylhexane
1,trans-2,cis-4-Trimethylcyclopentane
3,3-Dimethylhexane
1,trans-2,cis-3-Trimethylcyclopentane
2,3,4-Trimethylpentane
Toluene + 2,3,3-Trimethylpentane
1,1,2-Trimethylcyclopentane
2,3-Dimethylhexane
2-Methyl-3-ethylpentane
2-Methylheptane
4-Methylheptane + 3-Methyl-3-ethylpentane
3,4-Dimethylhexane
1,cis-2,trans-4-Trimethylcyclopentane + 1,cis-2,cis-4-Trimethylcyclopentane
cis-1,3-Dimethylcyclohexane
3-Methylheptane + 1,cis-2,trans-3-Trimethylcyclopentane
3-Ethylhexane + trans-1,4-Dimethylcyclohexane
1,1-Dimethylcyclohexane
2,2,5-Trimethylhexane + trans-1,3-Ethylmethylcyclopentane
cis-1,3-Ethylmethylcyclopentane

Return to Table

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 26 | cis-1,3-Dimethylcyclopentane | 100 ppm | - |
| 27 | trans-1,3-Dimethylcyclopentane | 100 ppm | - |
| 28 | 3-Ethylpentane | 100 ppm | - |
| 29 | trans-1,2-Dimethylcyclopentane | 100 ppm | - |
| 30 | 2,2,4-Trimethylpentane | 100 ppm | - |
| 31 | n-Heptane | 100 ppm | - |
| 32 | Methylcyclohexane + cis-1,2-Dimethylcyclopentane | 100 ppm | - |
| 33 | 1,1,3-Trimethylcyclopentane + 2,2-Dimethylhexane | 100 ppm | - |
| 34 | Ethylcyclopentane | 100 ppm | - |
| 35 | 2,5-Dimethylhexane + 2,2,3-Trimethylpentane | 100 ppm | - |
| 36 | 2,4-Dimethylhexane | 100 ppm | - |
| 37 | 1,trans-2,cis-4-Trimethylcyclopentane | 100 ppm | - |
| 38 | 3,3-Dimethylhexane | 100 ppm | - |
| 39 | 1,trans-2,cis-3-Trimethylcyclopentane | 100 ppm | - |
| 40 | 2,3,4-Trimethylpentane | 100 ppm | - |
| 41 | Toluene + 2,3,3-Trimethylpentane | 100 ppm | - |
| 42 | 1,1,2-Trimethylcyclopentane | 100 ppm | - |
| 43 | 2,3-Dimethylhexane | 100 ppm | - |
| 44 | 2-Methyl-3-ethylpentane | 100 ppm | - |
| 45 | 2-Methylheptane | 100 ppm | - |
| 46 | 4-Methylheptane + 3-Methyl-3-ethylpentane | 100 ppm | - |
| 47 | 3,4-Dimethylhexane | 100 ppm | - |
| 48 | 1,cis-2,trans-4-Trimethylcyclopentane + 1,cis-2,cis-4-Trimethylcyclopentane | 100 ppm | - |
| 49 | cis-1,3-Dimethylcyclohexane | 100 ppm | - |
| 50 | 3-Methylheptane + 1,cis-2,trans-3-Trimethylcyclopentane | 100 ppm | - |
| 51 | 3-Ethylhexane + trans-1,4-Dimethylcyclohexane | 100 ppm | - |
| 52 | 1,1-Dimethylcyclohexane | 100 ppm | - |
| 53 | 2,2,5-Trimethylhexane + trans-1,3-Ethylmethylcyclopentane | 100 ppm | - |
| 54 | cis-1,3-Ethylmethylcyclopentane | 100 ppm | - |

**Sample Information:**
trans-1,2-Ethylmethylcyclopentane
2,2,4-Trimethylhexane +
1,1-Ethylmethylcyclopentane
trans-1,2-Dimethylcyclohexane
1,cis-2,cis-3-Trimethylcyclopentane
trans-1,3-Dimethylcyclohexane + cis-1,4-Dimethylcyclohexane
n-Octane
Isopropylcyclopentane + 2,4,4-Trimethylhexane
cis-1,2-Ethylmethylcyclopentane + 2,3,5-Trimethylhexane
2,2-Dimethylheptane
cis-1,2-Dimethylcyclohexane
2,2,3-Trimethylhexane
2,4-Dimethylheptane
4,4-Dimethylheptane
Ethylcyclohexane + n-Propylcyclopentane
2-Methyl-4-ethylhexane
2,6-Dimethylheptane
1,1,3-Trimethylcyclohexane
2,5-Dimethylheptane + 9P
3,5-Dimethylheptane + 3,3-Dimethylheptane
Ethylbenzene
Unidentified Naphthene + 2,3,4-Trimethylhexane
m-Xylene
p-Xylene
2,3-Dimethylheptane
3,4-Dimethylheptane + N
3,4-Dimethylheptane
4-Ethylheptane + N
4-Methyloctane
2-Methyloctane
3-Ethylheptane + N

Return to Table

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 55 | trans-1,2-Ethylmethylcyclopentane | 100 ppm | - |
| 56 | 2,2,4-Trimethylhexane + 1,1-Ethylmethylcyclopentane | 100 ppm | - |
| 57 | trans-1,2-Dimethylcyclohexane | 100 ppm | - |
| 58 | 1,cis-2,cis-3-Trimethylcyclopentane | 100 ppm | - |
| 59 | trans-1,3-Dimethylcyclohexane + cis-1,4-Dimethylcyclohexane | 100 ppm | - |
| 60 | n-Octane | 100 ppm | - |
| 61 | Isopropylcyclopentane + 2,4,4-Trimethylhexane | 100 ppm | - |
| 62 | cis-1,2-Ethylmethylcyclopentane + 2,3,5-Trimethylhexane | 100 ppm | - |
| 63 | 2,2-Dimethylheptane | 100 ppm | - |
| 64 | cis-1,2-Dimethylcyclohexane | 100 ppm | - |
| 65 | 2,2,3-Trimethylhexane | 100 ppm | - |
| 66 | 2,4-Dimethylheptane | 100 ppm | - |
| 67 | 4,4-Dimethylheptane | 100 ppm | - |
| 68 | Ethylcyclohexane + n-Propylcyclopentane | 100 ppm | - |
| 69 | 2-Methyl-4-ethylhexane | 100 ppm | - |
| 70 | 2,6-Dimethylheptane | 100 ppm | - |
| 71 | 1,1,3-Trimethylcyclohexane | 100 ppm | - |
| 72 | 2,5-Dimethylheptane + 9P | 100 ppm | - |
| 73 | 3,5-Dimethylheptane + 3,3-Dimethylheptane | 100 ppm | - |
| 74 | Ethylbenzene | 100 ppm | - |
| 75 | Unidentified Naphthene + 2,3,4-Trimethylhexane | 100 ppm | - |
| 76 | m-Xylene | 100 ppm | - |
| 77 | p-Xylene | 100 ppm | - |
| 78 | 2,3-Dimethylheptane | 100 ppm | - |
| 79 | 3,4-Dimethylheptane + N | 100 ppm | - |
| 80 | 3,4-Dimethylheptane | 100 ppm | - |
| 81 | 4-Ethylheptane + N | 100 ppm | - |
| 82 | 4-Methyloctane | 100 ppm | - |
| 83 | 2-Methyloctane | 100 ppm | - |
| 84 | 3-Ethylheptane + N | 100 ppm | - |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

**Methods met:**
ASTM-D5134

**System Features**

- Single FID channel
- Good repeatability
- PIONA Report by Dragon DHA Software*

## Typical Chromatograms

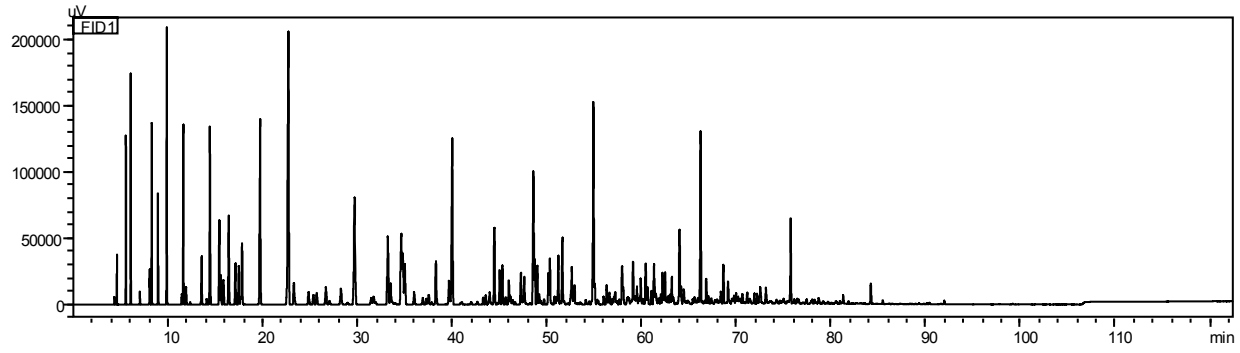


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Fig. 1 Chromatogram of FID

SUMMARY REPORT

| Group Type | Total(Mass%) | Total(Vol%) | Total(Mol%) |
|---|---|---|---|
| Paraffins: | 16.09 | 17.27 | 19.12 |
| I-Paraffins: | 19.99 | 21.17 | 22.47 |
| Olefins: | 0.10 | 0.10 | 0.14 |
| Napthenes: | 25.26 | 24.50 | 30.14 |
| Aromatics: | 8.90 | 8.38 | 9.92 |
| Total C10+: | 28.92 | 27.84 | 17.48 |
| Total Unknowns: | 0.75 | 0.73 | 0.73 |

Oxygenates:

| | | |
|---|---|---|
| Total: | 0.00(Mass%) | 0.00(Vol%) |
| Total Oxygen Content: | 0.00(Mass%) | |

Multisubstituted Aromatics: 4.22(Mass%) 3.73(Vol%)

Average Molecular Weight: 119.92

Relative Density: 0.73

Reid Vapor Pressure @ 100F: 2.10psi - 14.46kPa

Calculated Octane Number: 46.5

Motor Octane Number (Jenkins Calculation): 45.4

| | IBP | T10 | T50 | T90 | FBP |
|---|---|---|---|---|---|
| BP by Mass (Deg F) | 82.11 | 174.54 | 258.22 | 488.66 | 488.66 |
| BP by Vol (Deg F) | 82.11 | 174.54 | 258.22 | 488.66 | 488.66 |

Percent Carbon: 85.54 Percent Hydrogen: 14.46

Bromine Number (Calc): 0.15

Fig. 2 Example of PIONA Report *

* Dragon DHA software is registered trademark of Envantage Inc.

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# Transformer Oil Gas Analysis System (TOGA)

It is necessary to analyze outgas in transformer insulation oil in power plant facilities. Shimadzu offers a System GC compliant with ASTM D 3612 Method B (oil stripper sampling) or ASTM D 3612 Method C (headspace sampling). The Nexis GC-2030TOGAS3 system, equipped with a PDHID, enables the analysis of more trace amounts of permanent gas than conventional systems.

| **Transformer Oil Gas Analysis System (TOGA)** | | | | |
|---|---|---|---|---|
| **Reference Methods** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM D 3612B | $H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, C2 in transformer oil | FID, TCD | 16 minutes | **No. 32** |
| ASTM D 3612C | $H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, C2 in transformer oil | FID, TCD | 16 minutes | **No. 33** |
| ASTM D 3612C | $H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, C2 in transformer oil | FID, TCD, PDHID | 16 minutes | **No. 34** |

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Application Data Sheet

No.32

# System Gas Chromatograph

## TOGAS Analysis System with oil stripper device

## Nexis GC-2030TOGAS1
## GC-2014TOGAS1

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A simple and efficient method based on the technique of oil stripper sampling and valve switching is used for this TOGAS analysis. The sample is directed into the main-column-1 (P-N) by using a sample syringe, and separated in groups. The permanent gas and CH4 are directed into main-column-2 (MS-13X) through 2-1, and H2, O2, and N2 are detected by TCD. CH4 and CO deoxidized into CH4 by MTN-1 are detected by FID. Valve switching occurs before the CO2 is directed into main-column-2. The other hydrocarbons and CO2 are directed into main-column-3 (P-Q). They are detected by FID. After the detection of C2H2, the valve is immediately switched to its original position to wait for the next analysis. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
Two valves / four packed columns / TCD / FID with Methanizer

**Sample Information:**
$H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, $C_2$ in transformer oil

**Methods met:**
ASTM-D3612B

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2 | 20ppm | 10% |
| 2 | O2 | 500ppm | 1% |
| 3 | N2 | 500ppm | 10% |
| 4 | CH4 | 1ppm | 1% |
| 5 | CO | 2ppm | 2% |
| 6 | CO2 | 2ppm | 2% |
| 7 | C2H6 | 1ppm | 1% |
| 8 | C2H4 | 1ppm | 1% |
| 9 | C2H2 | 1ppm | 1% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single channel with packed column
- Oil sample is analyzed by using technique of oil stripper sampling and valve switching
- 16 minute analysis time
- Trace level of CO and CO2 are deoxidized into CH4 by methanizer and detected by FID

## Typical Chromatograms

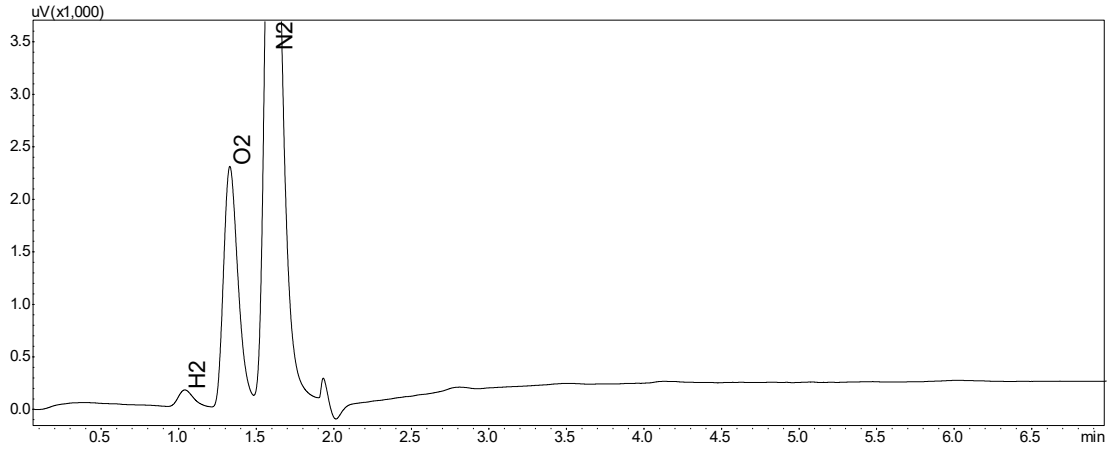


Fig. 1 Chromatogram of TCD

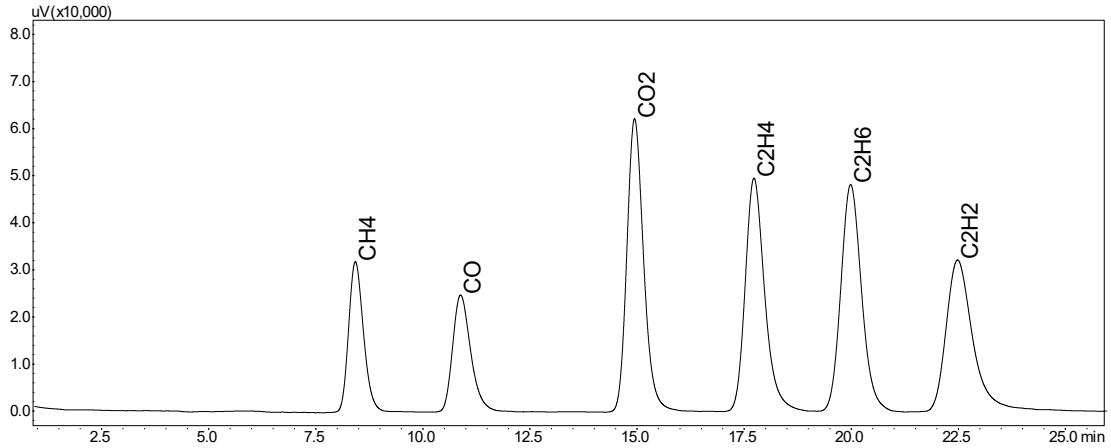


Fig. 2 Chromatogram of FID

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No.33

# System Gas Chromatograph

## TOGAS Analysis System with Manual Sampling

## Nexis GC-2030TOGAS2
## GC-2014TOGAS2

Return to Table

A simple and efficient method based on the technique of manual sampling and valve switching is developed for the analysis of TOGAS. The sample is directed into main-column-1 (P-N) through headspace, and separated in groups. The permanent gas and CH4 are directed into main-column-2 (MS-13X) through 2-1, and H2, O2, and N2 are detected by TCD. CO and CO2, reduced into CH4 by a methanizer, are detected by FID. Valve switching occurs before the CO2 is directed into main-column-2The other hydrocarbons and CO2 are directed into main-column- 3 (P-Q). They are detected by FID.
After the detection of C2H2, the valve is immediately backed to its original position to wait for the next analysis. A headspace injector can be connected to configure TOGAS analysis with a headspace device. The system includes LabSolutions GC workstation software.

### Analyzer Information

**System Configuration:**
Two valves / four packed columns / TCD / Methanizer with FID

**Sample Information:**
$H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, $C_2$ in transformer oil

**Methods met:**
ASTM-D3612C

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2 | 2.5ppm | 50ppm |
| 2 | O2 | 50ppm | 500ppm |
| 3 | N2 | 50ppm | 1% |
| 4 | CH4 | 1ppm | 1% |
| 5 | CO | 1ppm | 1% |
| 6 | CO2 | 1ppm | 1% |
| 7 | C2H6 | 1ppm | 1% |
| 8 | C2H4 | 1ppm | 1% |
| 9 | C2H2 | 1ppm | 1% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single channel with packed columns
- Manual sampling and valve switching with optional head space
- 16 minute analysis time
- Trace level of CO and CO2 are deoxidized into CH4 by Methanizer and detected by FID

## Typical Chromatograms

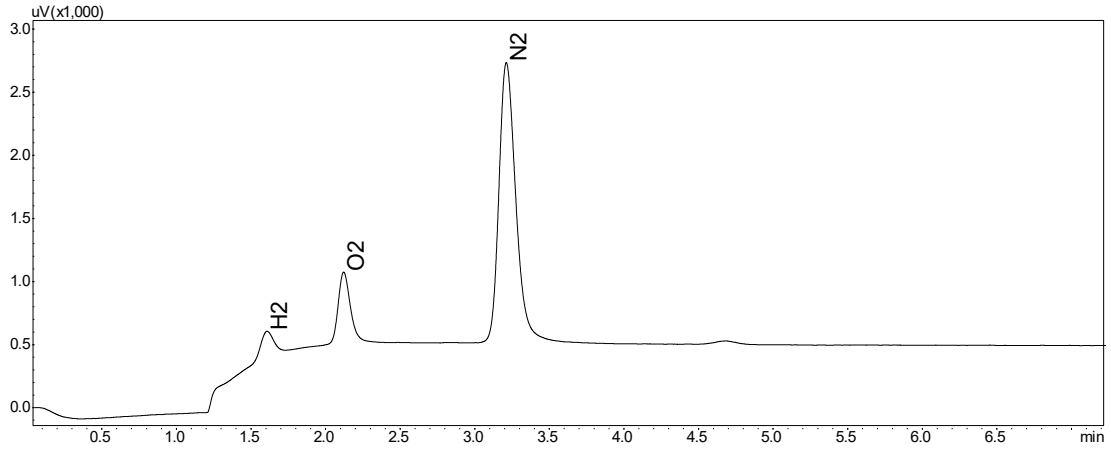


Fig. 1 Chromatogram of TCD

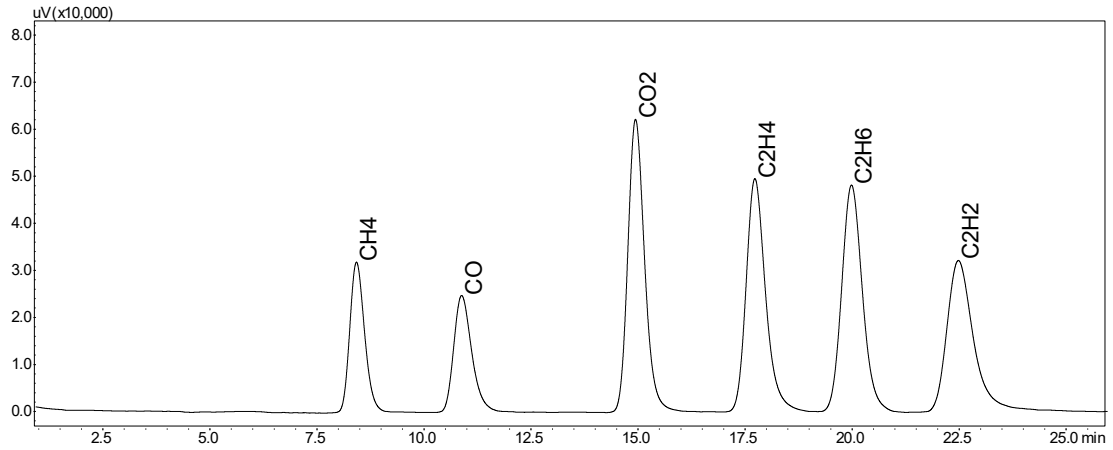


Fig. 2 Chromatogram of FID

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No.34

# System Gas Chromatograph

## TOGAS Analysis System with manual sampling

# Nexis GC-2030TOGAS3
# GC-2014TOGAS3

Return to Table

A simple and efficient method based on the technique of manual sampling and valve switching is developed for the analysis of TOGAS. The sample is directed into main-column-1 (P-N) through headspace, and separated in groups. The permanent gas and CH4 are directed into main-column-2 (MS-13X) through 2-1. H2, CH4, and CO are detected by PDHID, and O2, N2 are detected by TCD with additional valve switching. CO2 reduced into CH4 by a methanizer is detected by FID. Valve switching occurs before the CO2 is directed into main-column-2. The other hydrocarbons and CO2 are directed into main-column-3 (P-T) through 6-5. They are detected by FID. After the detection of C4H10, the valve is immediately backed to its original position to wait for the next analysis. A headspace injector can be connected to configure TOGAS analysis with a headspace device. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Three valves / four packed columns / TCD / PDHID/ Methanizer with FID

**Sample Information:**
$H_2$, $O_2$, $N_2$, $CH_4$, CO, $CO_2$, $C_2$ in transformer oil

**Methods met:**
ASTM-D3612C

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2 | 0.1ppm | 500ppm |
| 2 | O2 | 50.0ppm | 50000ppm |
| 3 | N2 | 50.0ppm | 50000ppm |
| 4 | CH4 | 0.1ppm | 500ppm |
| 5 | CO | 0.1ppm | 500ppm |
| 6 | CO2 | 1.0ppm | 1000ppm |
| 7 | C2H6 | 0.1ppm | 10000ppm |
| 8 | C2H4 | 0.1ppm | 10000ppm |
| 9 | C2H2 | 0.1ppm | 10000ppm |
| 10 | C3H8 | 0.2ppm | 10000ppm |
| 11 | C3H6 | 0.2ppm | 10000ppm |
| 12 | i-C4H10 | 1.0ppm | 10000ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single channel with packed columns
- Manual sampling and valve switching with optional head space
- 16 minute analysis time
- Trace level of CO and CO2 are deoxidized into CH4 by Methanizer and detected by FID

## Typical Chromatograms

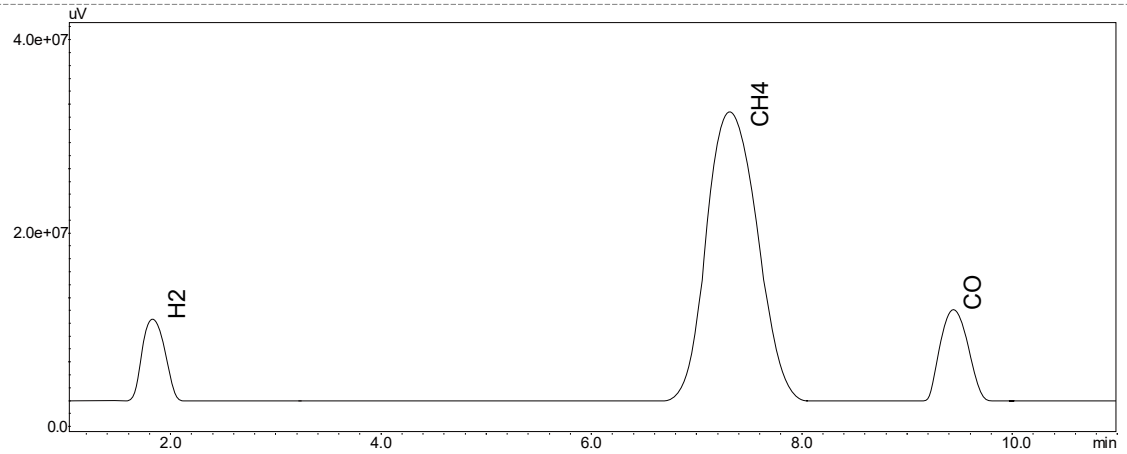


Fig. 1 Chromatogram of PDHID

Return to Table

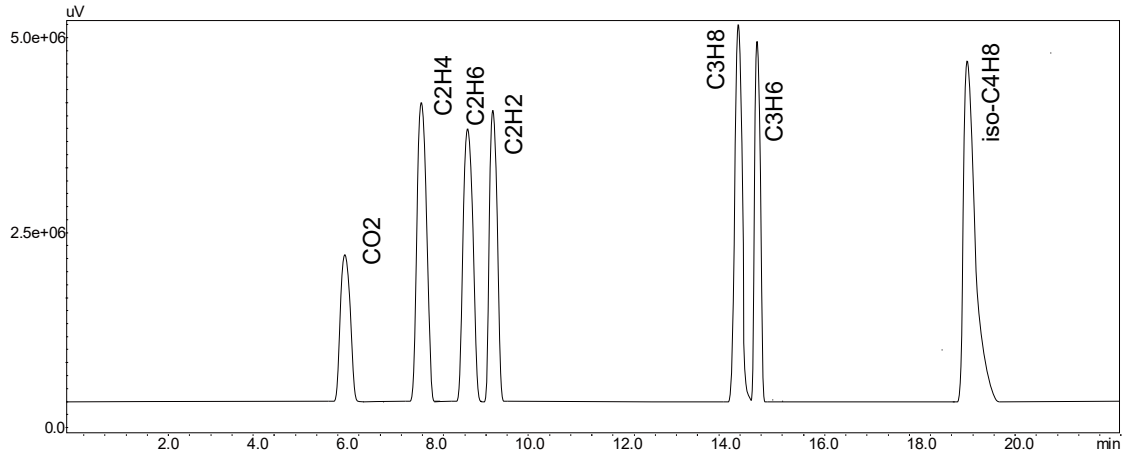


Fig. 2 Chromatogram of FID

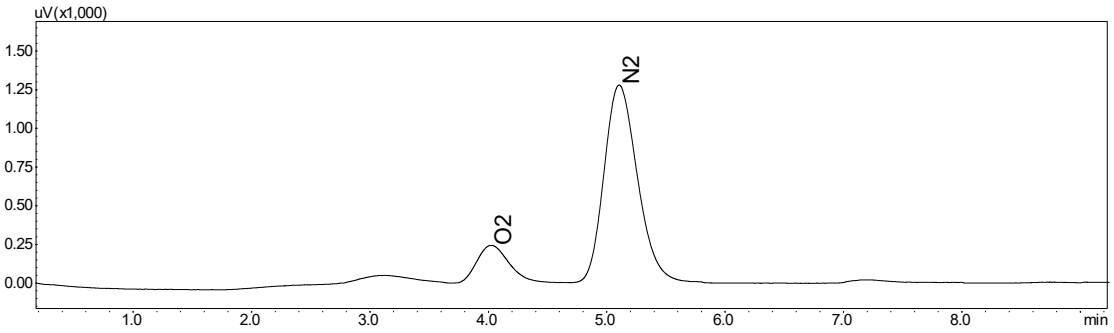


Fig. 3 Chromatogram of TCD

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# Town Gas Analysis

Periodical monitoring of calorific values is necessary to ensure a stable supply of town gas. Since Shimadzu's system GC is robust and designed for automated analysis, it is widely used for 24 hour/day online analysis in this field.
Dedicated software is able to calculate calorific values and indexes automatically.
Using the sample line selector SLS-2020, a single system GC can analyze multiple samples without switching the sample line. This saves both running and initial costs.

| **Town Gas Analysis** | | | | |
|---|---|---|---|---|
| **Reference Methods** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM D-1946 | $H_2$, $O_2$, $N_2$, CO, $CO_2$, C1, C2, C3 (each min. detection limit: 50 ppm) | TCDx2 | 16 minutes | **No. 13** |
| ASTM D-1946 | $O_2$, $N_2$, CO, $CO_2$, C1, C2, C3 (each min. detection limit: 50 ppm) | TCD | 16 minutes | **No. 14** |
| ASTM D-1946 | $H_2$, $O_2$, $N_2$, CO, $CO_2$, C1, C2, C3 (H2>0.1%, Others>50 ppm) | TCD | 10 minutes | **No. 15** |
| - | $H_2$, $O_2$, $N_2$, CO, $CO_2$, C1, C2 (H2>0.1%, Others>50 ppm) | TCD | 12 minutes | **No. 16** |

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Application Data Sheet

No.13

# System Gas Chromatograph

# Town Gas Analysis
# Nexis GC-2030TGA1
# GC-2014TGA1

Return to Table

The system enables quantitative and qualitative analysis of He, H2, O2, N2, CO, CO2 and C1to C3 in municipal gas. A fixed volume of gaseous sample is loaded into the GC and individual components of the sample are identified using two thermal conductivity detectors (TCD). The system is equipped with three automated valves. LabSolutions GC workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
Three valves / six packed columns with Dual TCD detectors

**Sample Information:**
$H_2$, $O_2$, $N_2$, CO, $CO_2$, $C_1$, $C_2$, $C_3$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.01% | 10% |
| 2 | H2 | 0.01% | 10% |
| 3 | O2 | 0.01% | 50% |
| 4 | N2 | 0.01% | 50% |
| 5 | CO | 0.01% | 10% |
| 6 | CH4 | 0.01% | 90% |
| 7 | CO2 | 0.01% | 10% |
| 8 | C2H2 | 0.01% | 40% |
| 9 | C2H4 | 0.01% | 40% |
| 10 | C2H6 | 0.01% | 40% |
| 11 | C3H8 | 0.01% | 40% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual channel with packed columns
- About 20 minutes analysis time
- Calorific value software is available
- Full range capability for $H_2$

## Typical Chromatograms

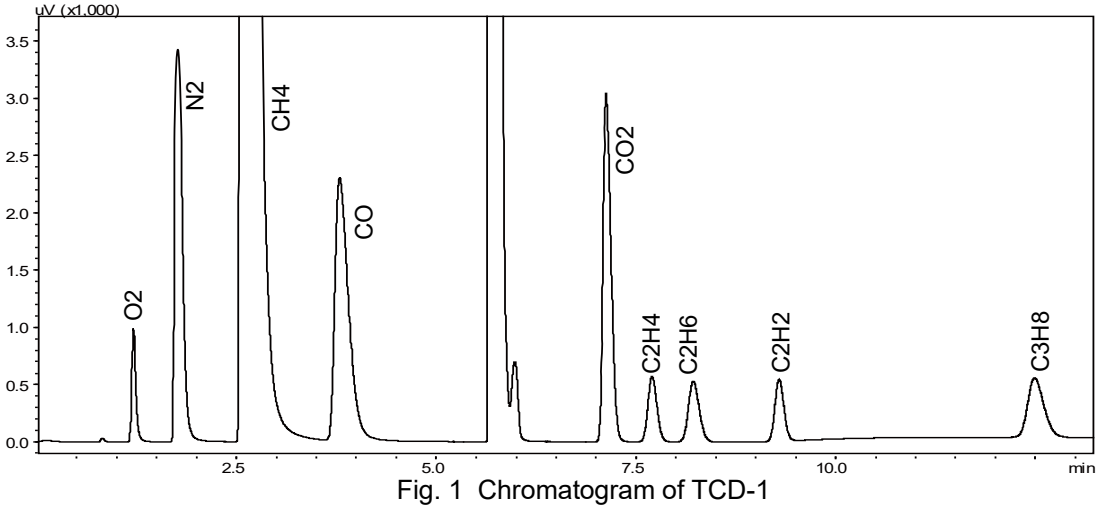


Fig. 1 Chromatogram of TCD-1

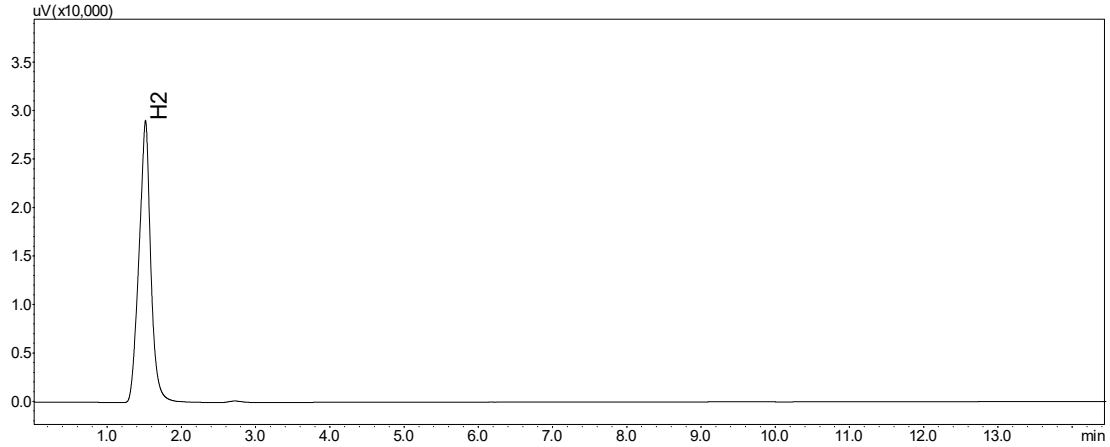


Fig. 2 Chromatogram of TCD-2

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No.14

# System Gas Chromatograph

# Town Gas Analysis
# Nexis GC-2030TGA2
# GC-2014TGA2

Return to Table

The system enables quantitative and qualitative analysis of He, O2, N2, CO, CO2 and C1 to C3 in municipal gas. A fixed volume of gaseous sample is loaded into the GC and individual components of the sample are identified using two thermal conductivity detectors (TCD). The system is equipped with three automated valves. LabSolutions GC workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

### System Configuration:
Two valves / four packed columns with TCD detector

### Sample Information:
$O_2$, $N_2$, CO, $CO_2$, $C_1$, $C_2$, $C_3$

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | O2 | 0.01% | 50% |
| 2 | N2 | 0.01% | 50% |
| 3 | CO | 0.01% | 10% |
| 4 | CH4 | 0.01% | 90% |
| 5 | CO2 | 0.01% | 10% |
| 6 | C2H2 | 0.01% | 40% |
| 7 | C2H4 | 0.01% | 40% |
| 8 | C2H6 | 0.01% | 40% |
| 9 | C3H8 | 0.01% | 40% |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Dual channel with packed columns
- About 20 minutes analysis time
- Calorific value software is available

## Typical Chromatograms

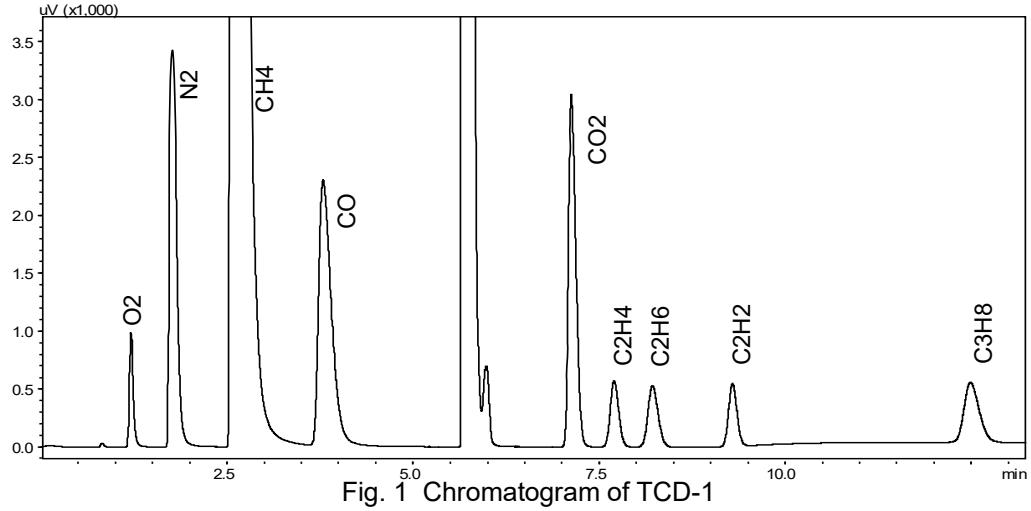


Fig. 1 Chromatogram of TCD-1

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No.15

# System Gas Chromatograph

# Town Gas Analysis
# Nexis GC-2030TGA3
# GC-2014TGA3

Return to Table

The system enables quantitative and qualitative analysis of He, H2, O2, N2, CO, CO2 and C1 to C3 in municipal gas. A fixed volume of gaseous sample is loaded into the GC and individual components of the sample are identified using two thermal conductivity detectors (TCD). The system is equipped with three automated valves. LabSolutions GC workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
Two valves / four packed columns with TCD detector

**Sample Information:**
$H_2$, $O_2$, $N_2$, CO, $CO_2$, $C_1$, $C_2$, $C_3$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.01% | 10% |
| 2 | H2 | 0.01% | 10% |
| 3 | O2 | 0.1% | 50% |
| 4 | N2 | 0.1% | 50% |
| 5 | CO | 0.1% | 10% |
| 6 | CH4 | 0.1% | 90% |
| 7 | CO2 | 0.1% | 10% |
| 8 | C2H2 | 0.1% | 40% |
| 9 | C2H4 | 0.1% | 40% |
| 10 | C2H6 | 0.1% | 40% |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Single channel with packed columns
- About 20 minutes analysis time with Ar carrier gas
- Calorific value software is available
- Good separation between $CH_4$ and CO

## Typical Chromatograms

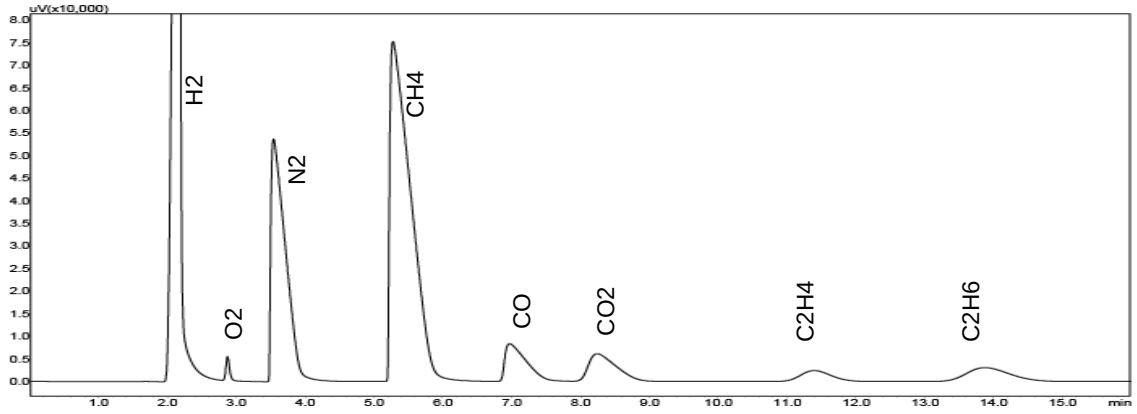


Fig. 1 Chromatogram of TCD

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# System Gas Chromatograph

# Town Gas Analysis
# Nexis GC-2030TGA4
# GC-2014TGA4

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The system enables quantitative and qualitative analysis of He, H2, O2, N2, CO, CO2 and C1 to C3 in municipal gas. A fixed volume of gaseous sample is loaded into the GC and individual components of the sample are identified using two thermal conductivity detectors (TCD). The system is equipped with three automated valves. LabSolutions GC workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

### System Configuration:
Two valves / three packed columns with TCD detector

### Sample Information:
$H_2$, $O_2$, $N_2$, CO, $CO_2$, $C_1$, $C_2$

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.01% | 10% |
| 2 | H2 | 0.01% | 10% |
| 3 | O2 | 0.1% | 50% |
| 4 | N2 | 0.1% | 50% |
| 5 | CO | 0.1% | 10% |
| 6 | CH4 | 0.1% | 90% |
| 7 | CO2 | 0.1% | 10% |
| 8 | C2H2 | 0.1% | 40% |
| 9 | C2H4 | 0.1% | 40% |
| 10 | C2H6 | 0.1% | 40% |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Single channel with packed columns
- About 12 minute analysis time with Ar carrier gas
- Column sealed technology for $CH_4$ and CO
- Calorific value software is available
- Good separation between $CH_4$ and CO

## Typical Chromatograms

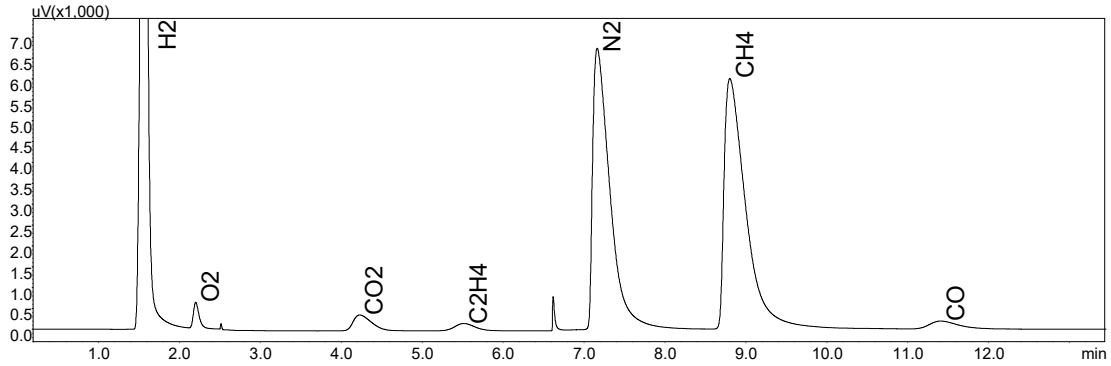


Fig. 1 Chromatogram of TCD

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# Trace Sulfur Analysis

Some sulfur compounds are known to be not only hazardous but also catalytic poisons. ppb sulfur analysis is conducted by gas chromatography. The GC-2030PFPD3 combines 1 PFPD and 2 different types of columns to improve separation performance.

| **Town Gas Analysis** | | | | |
|---|---|---|---|---|
| **Reference Methods** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| ASTM-D6228 | $H_2S$, COS, $SO_2$, mercaptans | PFPD | 18 minutes | **No. 9** |
| ASTM-D6228 | $H_2S$, COS, $SO_2$, mercaptans | PFPD | 18 minutes | **No. 10** |
| ASTM-D6228 | $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides | PFPD | 18, 40 minutes | **No. 11** |
| ASTM-D6228 | $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides | FPD | 18 minutes | **No. 12** |
| ASTM-D4735 | Thiophene in benzene | PFPD | 13 minutes | **No. 172** |
| - | $H_2S$, COS | FPD | 20 minutes | **No. 68** |
| - | $H_2S$, $SO_2$ | TCD | 8 minutes | **No. 73** |

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No.9

# System Gas Chromatograph

# Sulfur Analyzer
# Nexis GC-2030PFPD1
# GC-2014PFPD1

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This method is for determining the sulfide compounds in air using a pulsed flame photometric detector (PFPD) and capillary column. Standard sulfur gas or a permeation source can be used to make a calibration curve. This GC uses one valve and one capillary column. The sample is introduced into the sample loop for determination. Sample lines, including injection port, are inert in order to avoid absorption of the sulfur compounds. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
One valve / Capillary Inlet / Capillary column / PFPD detector

**Sample Information:**
Sulfur compounds in natural gas or gaseous fuels , such as $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides.

**Methods met:**
ASTM-D6228

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2S | 0.05ppmV | 100ppmV |
| 2 | COS | 0.05ppmV | 100ppmV |
| 3 | MeSH | 0.05ppmV | 100ppmV |
| 4 | EtSH | 0.05ppmV | 100ppmV |
| 5 | DMS | 0.05ppmV | 100ppmV |
| 6 | CS2 | 0.05ppmV | 100ppmV |
| 7 | PrSH | 0.05ppmV | 100ppmV |
| 8 | BuSH | 0.05ppmV | 100ppmV |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Sulfur analysis in refinery gas, natural gas, process gas and gaseous fuels
- Standard sulfur gas and permeation source can be used for making calibration curve
- Sample lines including injection port inert in order to avoid absorption
- High selectivity for sulfur

## Typical Chromatograms

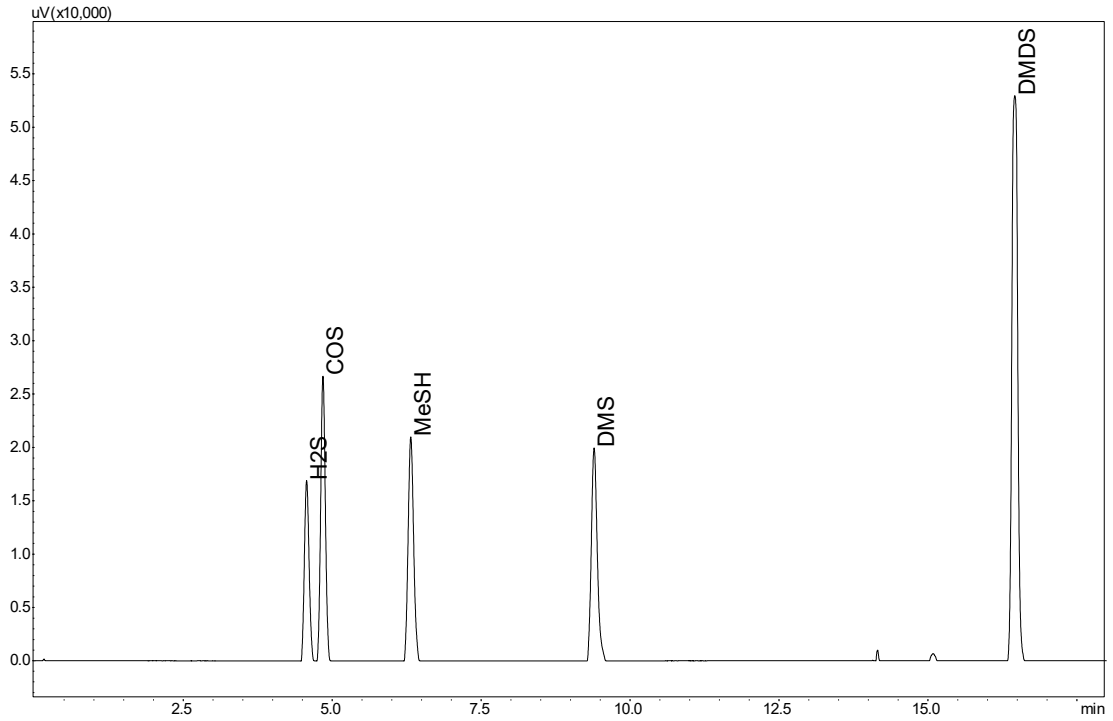


Fig. 1 Chromatogram of PFPD

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# System Gas Chromatograph

# Sulfur Analyzer
# Nexis GC-2030PFPD2
# GC-2014PFPD2

Return to Table

This method is for determining the sulfide compounds in gasoline using a pulsed flame photometric detector (PFPD) and capillary column. This system is composed of one split/splitless injection port, one capillary column and one PFPD. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Capillary Inlet / Capillary column / PFPD detector

**Sample Information:**
Sulfur compounds in light petroleum liquids , such as $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides

**Methods met:**
ASTM-D6228

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2S | 0.05ppmV | 100ppmV |
| 2 | COS | 0.05ppmV | 100ppmV |
| 3 | MeSH | 0.05ppmV | 100ppmV |
| 4 | EtSH | 0.05ppmV | 100ppmV |
| 5 | DMS | 0.05ppmV | 100ppmV |
| 6 | CS2 | 0.05ppmV | 100ppmV |
| 7 | PrSH | 0.05ppmV | 100ppmV |
| 8 | BuSH | 0.05ppmV | 100ppmV |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Sulfur analysis in light petroleum liquids and gasoline
- Sample lines including injection port inert in order to avoid absorption
- High selectivity for sulfur
- Equimolar, simplifies quantification of unknowns

## Typical Chromatograms

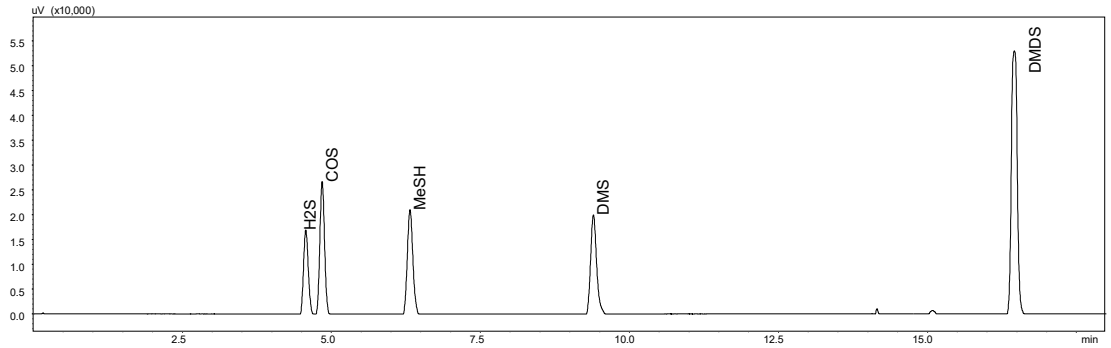


Fig. 1 Chromatogram of PFPD

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No.11

# System Gas Chromatograph

# Sulfur Analyzer
# Nexis GC-2030PFPD3
# GC-2014PFPD3

Return to Table

This method is for determining the sulfide compounds in LPG or LNG using a pulsed flame photometric detector (PFPD) and capillary column. The GS-Pro column is popular for sulfurs analysis. Non-polar columns, such as the Rtx-1, can be also used for sulfurs analysis. When using a Gas-Pro column, absorption of a trace amount of H2S is observed. On the other hand, when using a non-polar column, C3H6 and COS elute together. To solve these problems, this system uses two different columns simultaneously for separation of the sulfide compounds. A vaporized gas sample is divided into two sample loops to be injected into both columns. These two columns are combined before PFPD detection. Standard sulfur gas or a permeation source can be used to create a calibration curve. The standard gas and LPG/LNG sample are switched by an automatic sulfinert 6-port valve. LPG/LNG is vaporized by a vaporizer device, and the generated gas moves to the sulfinert sample loops (100 ul) to be injected into the two different columns. The system includes Lab Solutions GC workstation software. This system is applicable for the ASTM-D6228 method.

## Analyzer Information

**System Configuration:**
Capillary Inlet / Capillary column / PFPD detector

**Sample Information:**
Sulfur compounds in light petroleum liquids , such as $H_2S$, COS, $SO_2$, mercaptans, aromatic sulfur compounds and sulfides.

**Detection Limits:**
50 ppb

**Methods met:**
ASTM-D6228

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2S | 0.05ppmV | 100ppmV |
| 2 | COS | 0.05ppmV | 100ppmV |
| 3 | MeSH | 0.05ppmV | 100ppmV |
| 4 | EtSH | 0.05ppmV | 100ppmV |
| 5 | DMS | 0.05ppmV | 100ppmV |
| 6 | CS2 | 0.05ppmV | 100ppmV |
| 7 | PrSH | 0.05ppmV | 100ppmV |
| 8 | BuSH | 0.05ppmV | 100ppmV |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Sulfur analysis in light petroleum liquids and gasoline
- Sample lines including injection port inert in order to avoid absorption
- Simultaneously use Rtx-1 and Gas-Pro capillary column for separation of the sulfide compounds
- Vaporized gas sample is divided into two sample loops to be injected to two capillary column
- High selectivity for sulfur
- Equimolar simplifies quantification of unknowns

## Typical Chromatograms

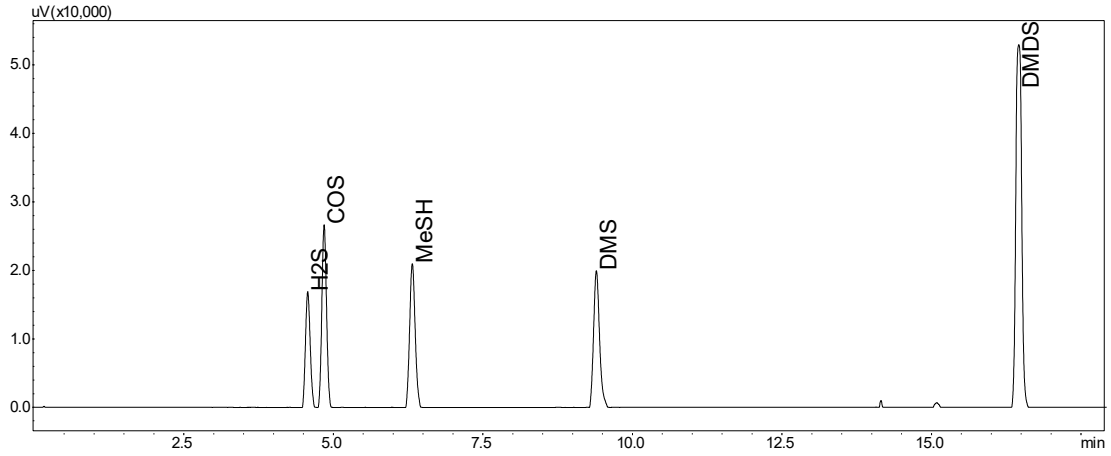


Fig. 1 Chromatogram of Gas-Pro Column

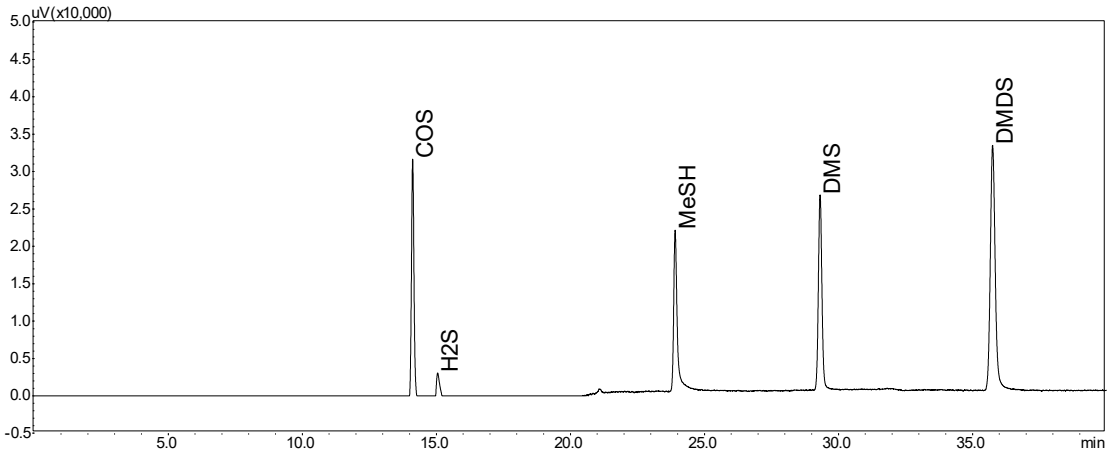


Fig. 2 Chromatogram of Rtx-1 Column

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# Application Data Sheet No.12

## System Gas Chromatograph

## Sulfur Analyzer
## Nexis GC-2030FPD
## GC-2014FPD

Return to Table

This method applies a chemically-inert material to prevent the absorption of sulfide components. The micro-packed column in this system effectively separates sulfide components and hydrocarbons, thereby avoiding the quenching phenomenon associated with Flame Photometric Detectors. The method can be used to analyze both inorganic and organic sulfides, providing an ideal solution for the analysis of natural gas and refinery gas, as well as liquid samples, such as organic solvents. The system includes LabSolutions GC workstation software. This system may not be suitable for gasoline analysis.

### Analyzer Information

**System Configuration:**
One valve / Capillary Inlet / Capillary column / FPD detector

**Sample Information:**
Sulfur compounds in natural gas , such as $H_2S$, COS, mercaptans, aromatic sulfur compounds and sulfides.

**Methods met:**
ASTM-D6228

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | H2S | 0.1ppmV | 100ppmV |
| 2 | COS | 0.1ppmV | 100ppmV |
| 3 | MeSH | 0.1ppmV | 100ppmV |
| 4 | EtSH | 0.1ppmV | 100ppmV |
| 5 | DMS | 0.1ppmV | 100ppmV |
| 6 | CS2 | 0.1ppmV | 100ppmV |
| 7 | PrSH | 0.1ppmV | 100ppmV |
| 8 | BuSH | 0.1ppmV | 100ppmV |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Sulfur analysis in refinery gas, natural gas, process gas
- Micro-packed column can separate sulfide components and hydrocarbons effectively
- Sample lines including injection port inert in order to avoid absorption
- High selectivity for sulfur
- Suitable for measuring S, P and Sn

## Typical Chromatograms

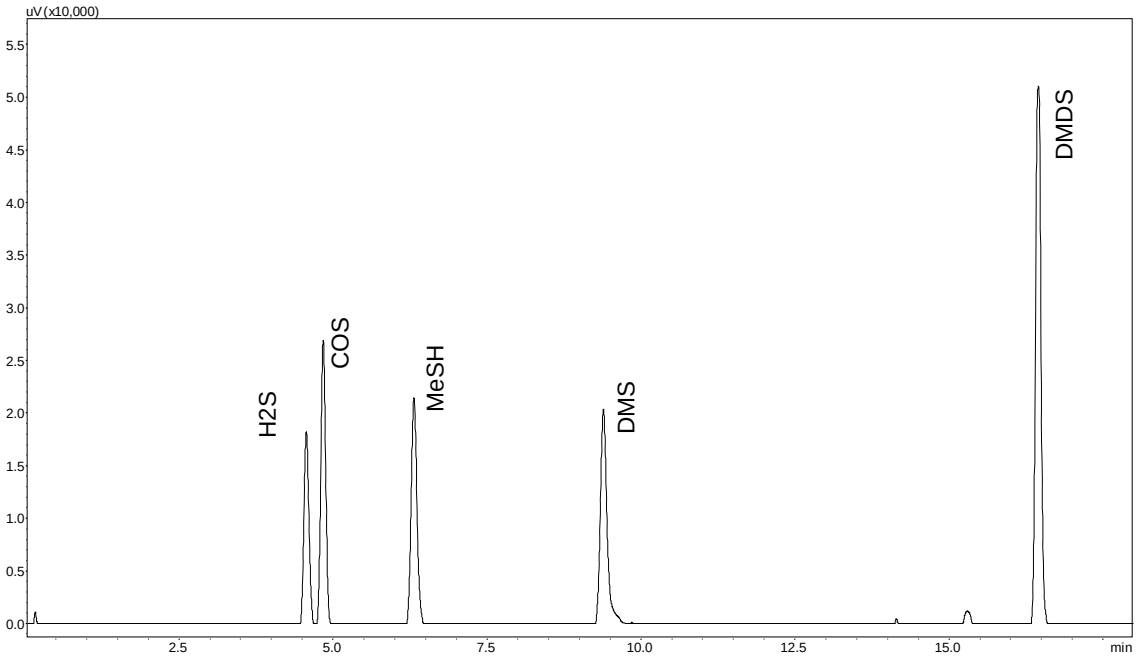


Fig. 1 Chromatogram of FPD

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No.172

## System Gas Chromatograph

# Thiophene in Refined Benzene Analysis
# Nexis GC-2030TIB
# GC-2014TIB

Return to Table

This method is for determining thiophene in refined benzene. Pulsed Flame Photometric Detector (PFPD) is used for trace level analysis of thiophene.

## Analyzer Information

**System Configuration:**
One valve and one SPL Injector / one capillary column / one PFPD detector

**Sample Information:**
Thiophene

**Methods met:**
ASTM-D4735

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Thiophene | 0.05 ppmw | 20 ppmw |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single PFPD channel
- Good repeatability
- Inert-materials are employed for preventing absorbing thiophene.

## Typical Chromatograms

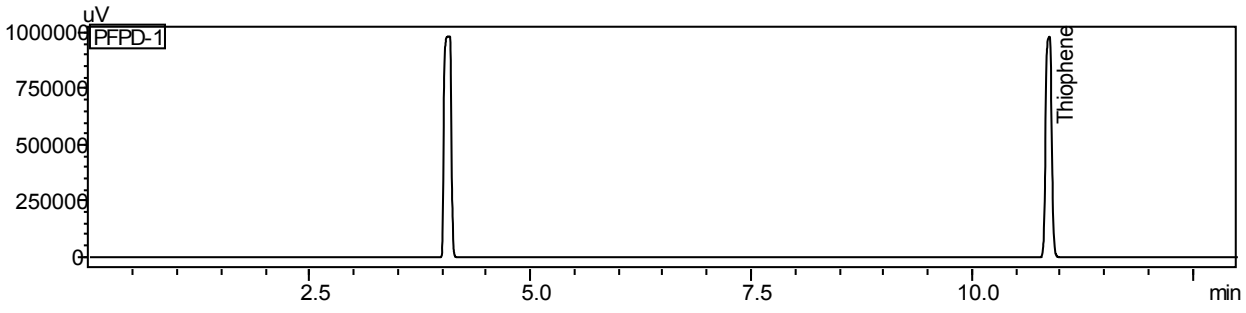


Fig. 1 Chromatogram of PFPD

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No.68

# System Gas Chromatograph

## Volatile Sulfur Compounds in Gaseous Fuels Analysis System

# Nexis GC-2030SUL1
# GC-2014SUL1

Return to Table

This instrument is designed to analyze for volatile sulfur compounds in gaseous fuels. The Sunpak-S packed column of this system can separate sulfide components and hydrocarbons effectively, avoiding the quenching phenomenon which can result in the weakening of the instrument's sensitivity. The method can analyze both inorganic and organic sulfides, providing an ideal solution that can be applied to the analysis of both natural gas and refinery gas as well as liquid sample such as organic solvents. This system may not be suitable for gasoline analysis.

## Analyzer Information

**System Configuration:**
One valve / two packed columns with one FPD detector

**Sample Information:**
$H_2S$, COS

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2S | 0.5ppm | 50ppm | FPD |
| 2 | COS | 0.5ppm | 50ppm | FPD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 12 minutes analysis for sulfur gases analysis can be carried out
- One FPD channel
- Good repeatability

## Typical Chromatograms

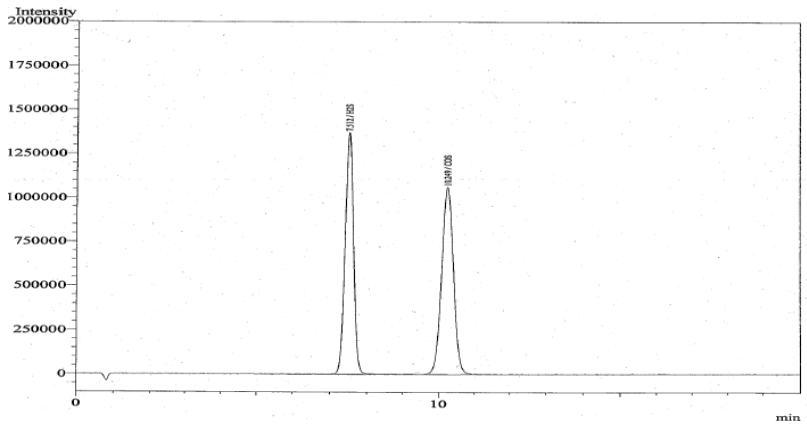


Fig. Chromatogram of FPD

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# System Gas Chromatograph

## $H_2S$ and $SO_2$ in C2, C3, and C4 Analysis System
## Nexis GC-2030SUL2
## GC-2014SUL2

Return to Table

This instrument is designed to analyze for H2S and SO2 in C2, C3, and C4 hydrocarbon streams. A Sunpak-S and silicagel packed column are used to separate the sulfur components from the hydrocarbons, avoiding the quenching phenomenon which can result in the loss of detector signal thus poor sensitivity. The method can analyze both inorganic and organic sulfur compounds, providing an ideal solution that can be applied to the analysis of both natural gas and refinery gas as well as liquid samples such as organic solvents. This system may not be suitable for gasoline analysis.

### Analyzer Information

**System Configuration:**
Two valve s/ four packed columns with one TCD detector

**Sample Information:**
$H_2S$, $SO_2$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2S | 0.01% | 30% | TCD |
| 2 | SO2 | 0.01% | 30% | TCD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One TCD channel
- Good repeatability

### Typical Chromatograms

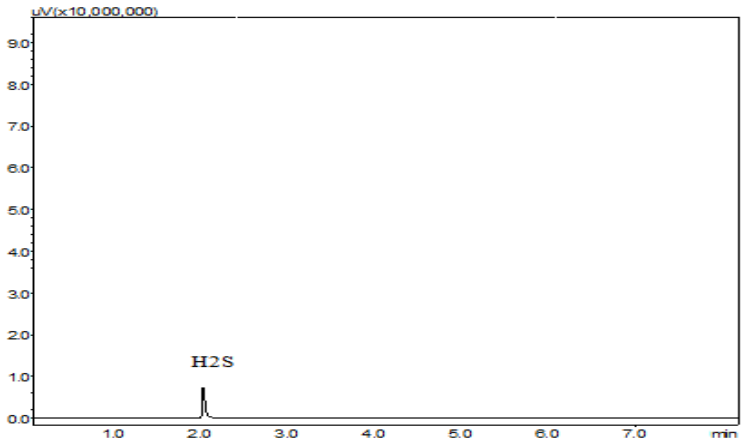


Fig. Chromatogram of TCD

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# Greenhouse Gases

Gas chromatographs help analyze greenhouse gases in air and soil. In addition to nitrous oxide, which is known by its high global warming potential, CO and CH4 are measured by a single analysis. The Nexis GC-2030NCCC1 enables simultaneous analysis of greenhouse gases and other permanent gases.

| **Green House Gas** | | | |
|---|---|---|---|
| **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| $N_2O$ > 50 ppb | ECD | 9 minutes | **No. 39** |
| $N_2O$ > 50 ppb, $O_2$, $N_2$, CO, $CO_2$, $CH_4$ > 0.01 % | Dual TCD, FID, ECD | 11 minutes | **No. 57** |
| $N_2O$ > 50 ppb, CO, $CO_2$, $CH_4$ > 0.01 % | FID, ECD | 11 minutes | **No. 58** |
| $N_2O$ > 50 ppb, $O_2$, $N_2$, CO, $CO_2$, $CH_4$ > 0.01 % | Dual TCD, ECD | 11 minutes | **No. 59** |
| $N_2O$ > 50 ppb, $CO_2$ > 100 ppm, $CH_4$ > 1 ppm | Dual TCD, FID, ECD | 9 minutes | **No. 122** |

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Application Data Sheet

No.39

# System Gas Chromatograph

# Nitrous Oxide ($N_2O$) Released from Soil Analyzer
# Nexis GC-2030$N_2O$1
# GC-2014$N_2O$1

Return to Table

This method provides for the determination of Nitrous oxide (N2O) released from soil by gas chromatography (GC) with an Electron Capture Detector (ECD) using Porapak-Q and Porapak-N packed columns. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Two valves / three packed columns with ECD detector

**Sample Information:**
$N_2O$ in Greenhouse gases and soil gases

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | N2O | 50 ppb | 200 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 9 minutes analysis can be carried out for greenhouse gases or soil gases analysis
- Single channel with ECD high sensitivity detector for ppb level N2O
- It is useful for agricultural research with meaningful information
- Linear calibration curve

## Typical Chromatograms

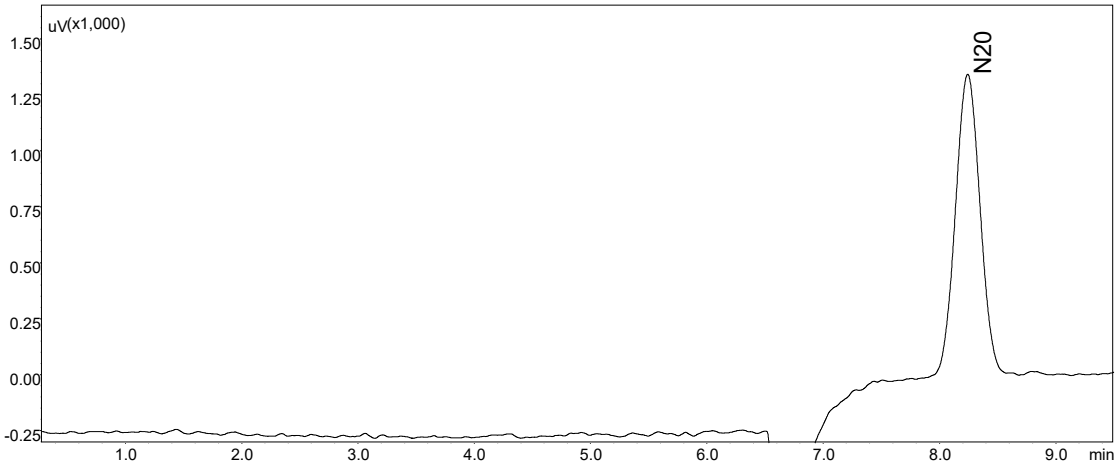


Fig. 1 Chromatogram of ECD

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Application Data Sheet

No.57

# System Gas Chromatograph

## $N_2O/CO/CO_2/CH_4$ analysis system (TCD/FID)

## Nexis GC-2030NCCC1
## GC-2014NCCC1

Return to Table

This method provides for the determination of Nitrous oxide (N2O) , in atmospheric air, by gas chromatography (GC) with Electron Capture detector (ECD) using Porapak-N and HayeSep-D packed column. A total of 5 valves and 7 columns are used in this GC system. Sample is introduced into two sample loops. The N2O is separated by the HayeSep-D column and detected by ECD.
The second channel can be used for permanent gas O2, N2, CH4, CO and CO2 analysis with TCD, also can be used for trace CH4, CO and CO2 analysis with FID. Since large amount of O2 gas affects life time of methanizer catalyst, O2 gas needs to be removed by additional 6 port valve.
Method-1: A Porapak-N pre column is used to to backflush the C2 compounds. A Porapak-N functions to separate Air/CH4/CO from CO2. The Air/CH4/CO peak is separated by MS-13X column into the individual components. CO2 moves through the Porapak-Q and is detected by the TCD.
Method-2: A Porapak-N column pre-column is used to backflush the C2 compounds. A Porapak N functions to separate CO/CH4 from CO2. The CO and CH4 are separated by MS-13X column. The CO2 bypasses the Mol Sieve 13X and moves through the Porapak-Q. The separated peaks are directed to a methanizer device. CO and CO2 are reduced to CH4 by means of nickel catalyst and detected by flame ionization detector (FID). The system includes Lab Solutions GC workstation software.

### Analyzer Information

**System Configuration:**
Five valves / seven packed columns with one ECD detector and one FID detector

**Sample Information:**
N2O, permanent gas

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | N2O | 50.00ppb | 100.00ppm | ECD |
| 2 | CH4 | 1.00ppm | 100.00ppm | FID |
| 3 | CO | 1.00ppm | 100.00ppm | MTN+FID |
| 4 | CO2 | 1.00ppm | 100.00ppm | MTN+FID |
| 5 | CH4 | 0.01% | 10.00% | TCD |
| 6 | CO | 0.01% | 10.00% | TCD |
| 7 | CO2 | 0.01% | 10.00% | TCD |
| 8 | N2 | 0.01% | 20.00% | TCD |
| 9 | O2 | 0.01% | 20.00% | TCD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One ECD and one FID channel
- Good repeatability

## Typical Chromatograms

Return to Table

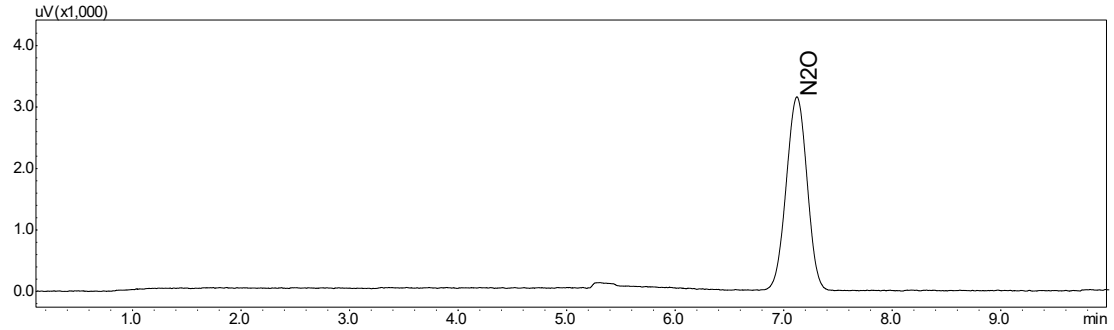


Fig. 1 Chromatogram of ECD

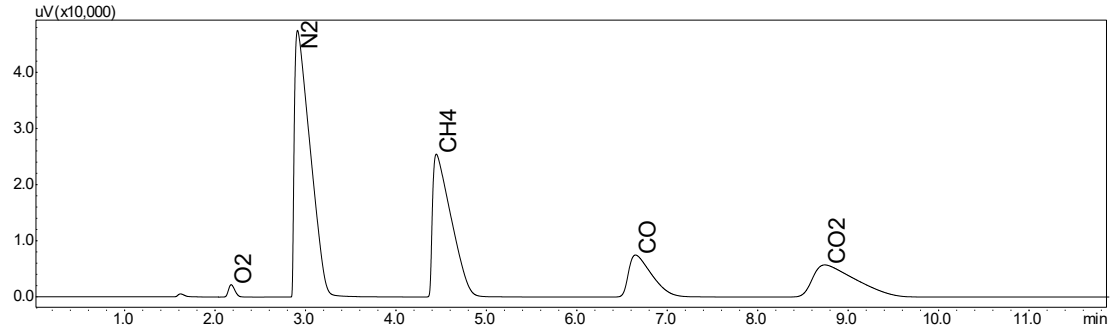


Fig. 2 Chromatogram of TCD

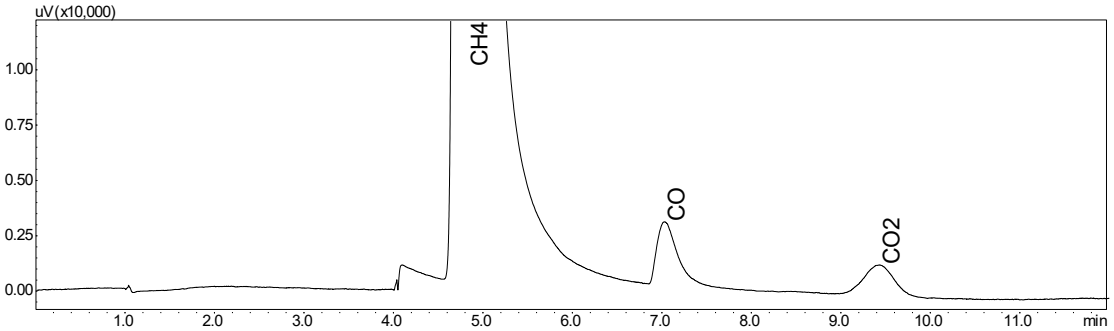


Fig. 3 Chromatogram of FID

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# System Gas Chromatograph

## $N_2O/CO/CO_2/CH_4$ analysis system (ECD/FID)

## Nexis GC-2030NCCC2
## GC-2014NCCC2

Return to Table

This method provides for the determination of nitrous oxide (N2O) , in atmospheric air, by gas chromatography (GC) with Electron Capture Detector (ECD) using Porapak-N and HayeSep-D packed column. A total of 5 valves and 7 columns are used in this GC system. Sample is introduced into two sample loops. In the first channel, N2O is separated by the HayeSep-D column and detected by ECD. In the second channel, the first Porapak-N column is a pre-column used to cut the above C2 compounds. The second Porapak functions to separate CO/CH4 and CO2. The final separation of CO and CH4 are performed by a MS-13X column. CO2 moves through the Porapak-Q and bypasses the Mol-Sieve 13X. CO, CH4 and CO2 are directed to a methanizer and are reduced to CH4 by means of nickel catalyst and detected by flame ionization detector (FID). The system includes LabSolutions GC workstation software. Since large amount of O2 gas affects life time of methanizer catalyst, O2 gas needs to be removed by additional 6 port valve.

### Analyzer Information

**System Configuration:**
Five valves / seven packed columns with one ECD detector and one FID detector

**Sample Information:**
N2O, permanent gas

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH3COCH3 | 5ppm | 500ppm | FID |
| 2 | Propylene aldehyde | 5ppm | 500ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One ECD/ one FID channel
- Good repeatability

## Typical Chromatograms

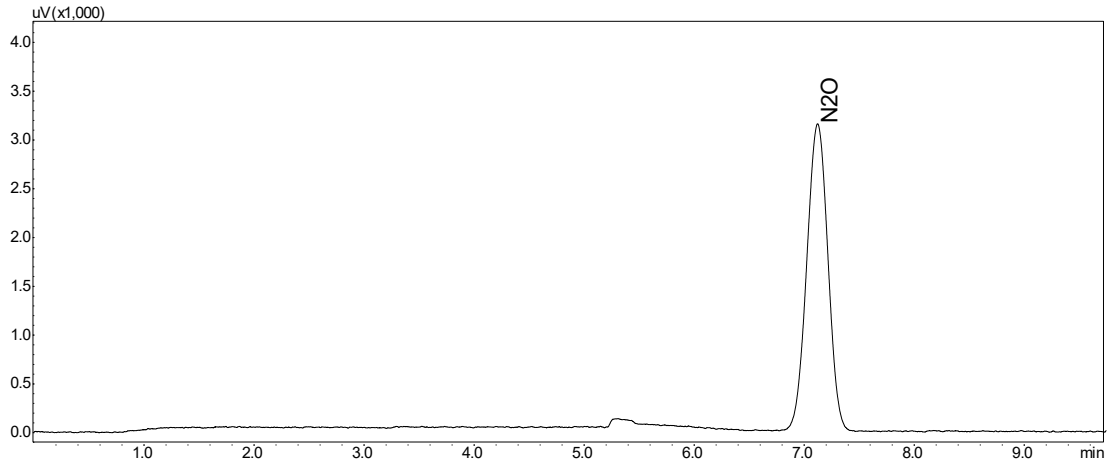


Fig. 1 Chromatogram of ECD

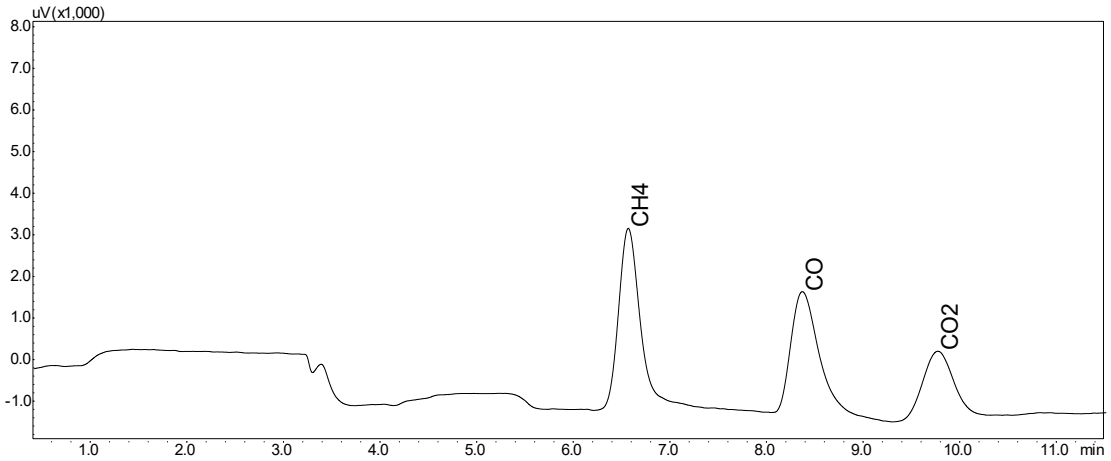


Fig. 2 Chromatogram of FID

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No.59

# System Gas Chromatograph

# $N_2O/CO/CO_2/CH_4$ analysis system (TCD) Nexis GC-2030NCCC3 GC-2014NCCC3

Return to Table

This method provides for the determination of nitrous oxide (N2O) released from soil by gas chromatography (GC) with Electron Capture detector (ECD) using Porapak-N and HayeSep-D packed column. A total of 5 valves and 7 columns are applied in this GC system. Sample is introduced into two sample loops for determination. Channel 1, the N2O is separated by the HayeSep-D column and detected by ECD. Channel 2, First Porapak-N column is pre-column to cut the above C2 compounds. Second Porapak-N functions to separate Air/CH4/CO and CO2. Air/CH4/CO are separated by MS-13X column. On the other hand, CO2 moves through Porapak-Q and detected by TCD. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Four valves / five packed columns with one ECD detector and one FID detector

**Sample Information:**
N2O, Permanent gas

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | N2O | 50.00ppb | 100.00ppm | ECD |
| 2 | CH4 | 0.01% | 10.00% | TCD |
| 3 | CO | 0.01% | 10.00% | TCD |
| 4 | CO2 | 0.01% | 10.00% | TCD |
| 5 | N2 | 0.01% | 20.00% | TCD |
| 6 | O2 | 0.01% | 20.00% | TCD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One ECD, one TCD channel
- Good repeatability

## Typical Chromatograms

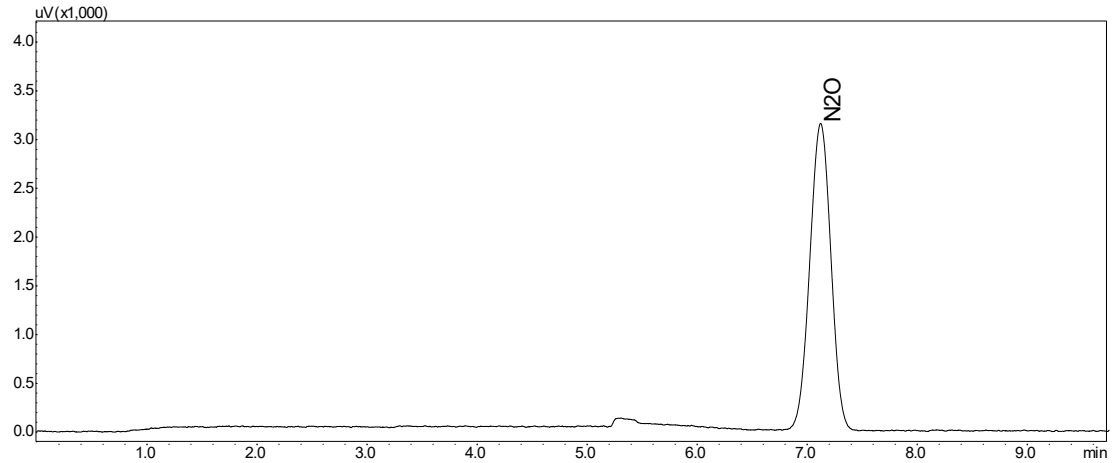


Fig. 1 Chromatogram of ECD

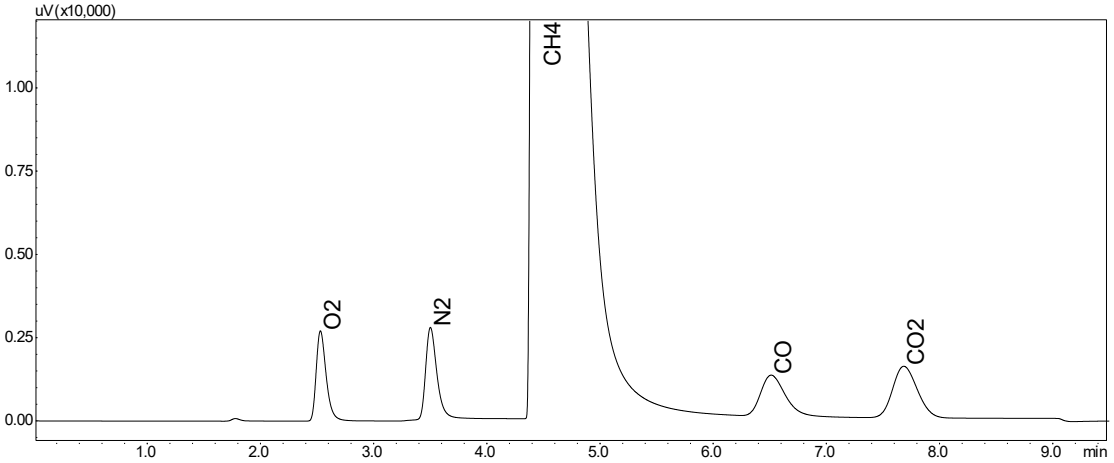


Fig. 2 Chromatogram of TCD

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No.122

# System Gas Chromatograph

## Nitrous Oxide ($N_2O$) Released from Soil Analyzer

## Nexis GC-2030 $N_2O$CC1

## GC-2014 $N_2O$CC1

Return to Table

This GC system is designed for determining the chemical composition of natural gases and similar gaseous mixtures within the composition range shown in the specification sheet. This test method provides data for calculating physical properties of the sample, such as heating value and relative density, or for monitoring the concentrations of one or more of the components in a mixture. A total of 5 valves and 8 columns are used in this GC system. Sample is loaded into three sample loops for determination. Using a pre-column, the C6+ components are back-flushed as a single peak. The valve timing then allows the hydrocarbons C3 through to C5 to be separated by an Alumina capillary column and detected by FID. Using a P-N column, Air+CO+CH4 elute as a mixed peak to a packed MS-5A column and then separated., Switching the valve, CO2, C2, H2S elute to a P-Q column and then separated and detected by TCD. The final analysis time is approximately 10 minutes. The system includes LabSolutions GC workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Four valves / seven packed columns with TCD, FID, and ECD detector

**Sample Information:**
$N_2O$ in greenhouse gases and soil gases

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | N2O | 50ppb | 170ppm | ECD |
| 2 | CH4 | 1ppm | 1000ppm | FID |
| 3 | CO2 | 100ppm | 1% | TCD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 9 minutes analysis for Greenhouse gases or soil gases analysis can be carried out
- Two channels with FID /TCD and ECD detectors
- Analyzer provides simultaneous analysis the gas with one injection
- Linear response, simplifies calibration

## Typical Chromatograms

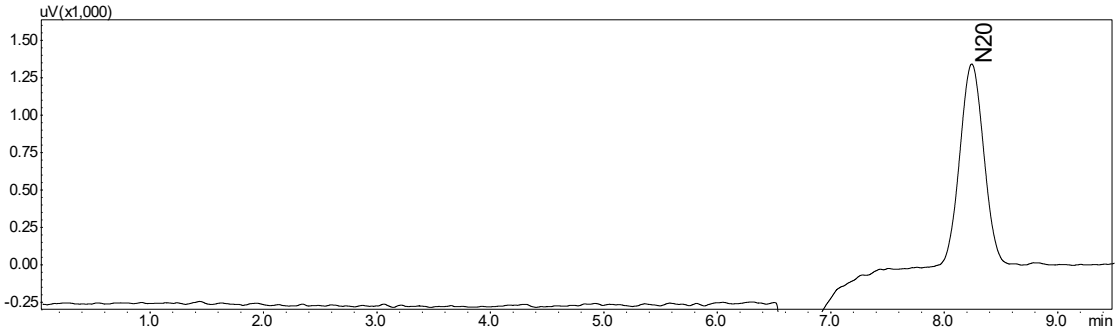


Fig.1 Chromatogram of ECD

Return to Table

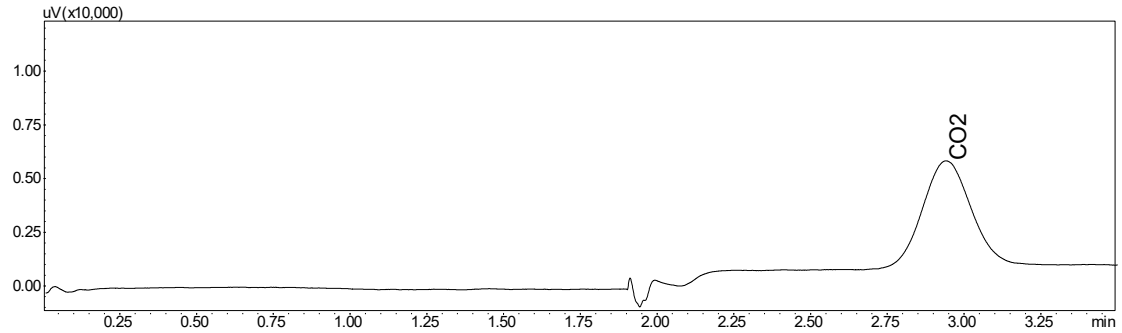


Fig.2 Chromatogram of TCD

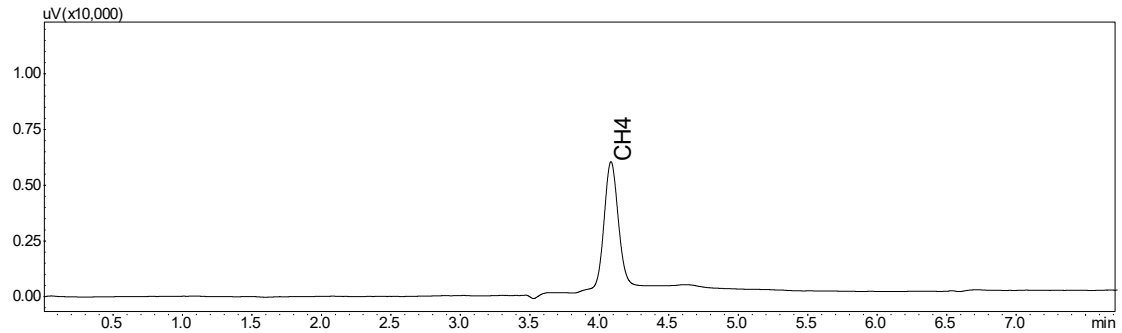


Fig. 3 Chromatogram of FID

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# Downstream and Others

A gas chromatograph is used for impurity analysis of intermediate or final products in various chemical fields.

| Downstream and Others | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| - | Acetone and Propylene Aldehyde | FID | 20 minutes | No. 87 |
| ASTM-D3695 | Alcohol in Water | FID | 30 minutes | No. 169 |
| - | Ammonia | TCD | 20 minutes | No. 74 |
| UOP-868 | Paraffins and naphthenes | FID | 85 minutes | No. 37 |
| UOP-870 | Carbon distribution of paraffins, naphthenes and aromatics | FID | 110 minutes | No. 38 |
| UOP-543 | Non-Aromatic Hydrocarbons in Aromatics | FID | 8 minutes | No. 176 |
| UOP-744 | C10 or Lower Boiling Aromatics Analysis | FID | 45 minutes | No. 183 |
| UOP-798 | 1,4-Diethylbenzene (p-DEB) in C8 and lower boiling aromatics | FID | 7 minutes | No. 184 |
| - | Benzene in hexane and 1-hexene | FID | 20 minutes | No. 95 |
| ASTM-D4492 | Impurities in Benzene | FID | 15 minutes | No. 171 |
| ASTM-D5713 | High Purity Benzene | FID | 19 minutes | No. 175 |
| - | Trace Hydrocarbons in Butene-1 | FID | 50 minutes | No. 89 |
| - | Isobutylene in 1-Butene | FID | 30 minutes | No. 111 |
| - | 1-Butene in Hexane | FID | 20 minutes | No. 109 |
| - | Hydrocarbons in Propylene | FIDx2 | 45 minutes | No. 69 |
| - | Trace Chlorinated Hydrocarbons in O2 | ECD | 20 minutes | No. 76 |
| - | Ethylene Oxide in MEG Unit Gas and Liquid Stream | TCD or FID | 10 minutes | No. 75 |
| - | Ethylene Glycol Composition | FID | 20 minutes | No. 77 |
| - | EO, EC, Glycol in MEG | FID | 35 minutes | No. 91 |
| - | EC, DEG, TEG, TTEG in MEG | FID | 30 minutes | No. 99 |
| UOP-690 | Octans and Lower Boiling Hydrocarbons in Olefin-Free Gasolines | FID | 10 minutes | No. 180 |
| UOP 725 | Lower Boiling Hydrocarbons in Olefinic Gasolines | FID | 30 minutes | No. 182 |
| ASTM-D2504 | Hydrogen, oxygen, nitrogen and methane in propylene | PDHID | 7 minutes | No. 168 |
| - | Hydrocarbon Gas, C1-C6 | FID | 30 minutes | No. 52 |
| UOP-551 | C6 and Lower Boiling Hydrocarbons in Olefin Free Naphthas | FID | 35 minutes | No. 177 |
| UOP-621 | Boiling Point Distributions of Liquid Hydrocarbons | FID | 20 minutes | No. 179 |

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# Downstream and Others (continued)

A gas chromatograph is used for impurity analysis of intermediate or final products in various chemical fields.

| Downstream and Others (continued) | | | | |
|---|---|---|---|---|
| **Reference Method** | **Target Compounds** | **Type of Detector** | **Analysis Time** | **Application Datasheet** |
| UOP-899 | Trace Hydrocarbons in LPG | FID | 25 minutes | No. 186 |
| - | Permanent Gas Analysis | TCDx2 | 15 minutes | No. 49 |
| - | Permanent Gas with CO/$CO_2$ Gas | TCD | 9 minutes | No. 53 |
| - | Permanent Gas with CO/$CO_2$ Gas | TCD | 9 minutes | No. 54 |
| - | $O_2$ – CO, Ar Analysis | TCDx2 | 35 minutes | No. 80 |
| - | CO, $CO_2$, $CH_4$ | FID | 8 minutes | No. 17 |
| - | CO, $CO_2$, $CH_4$ | TCD | 4 minutes | No. 18 |
| - | CO, $CO_2$, $CH_4$ | FID, TCD | 6 minutes | No. 19 |
| - | Trace CO, $CO_2$, $CH_4$ | FID | 14 minutes | No. 20 |
| - | Trace CO, $CO_2$, $CH_4$ | FID | 14 minutes | No. 21 |
| UOP-603 | CO, $CO_2$, $CH_4$ in Hydrogen/ Light Gaseous Hydrocarbons | FID | 15 minutes | No. 178 |
| - | Methanol, Methylformate, and Acetoaldehyde in Propylene Oxide | FIDx2 | 40 minutes | No. 108 |
| - | Formaldehyde in Propylene Oxide | FIDx2 | | No. 104 |
| - | Glycol, Cumene, Benzene in Propylene Oxide | FID | | No. 105 |
| UOP-831 | Hydrocarbons in Sulfolane | FID | | No. 185 |
| - | Volatile Organic Compounds in Atmospheric Air | FID | | No. 113 |
| - | Volatile Organic Phosphorus Compounds | FPD | | No. 101 |
| - | $H_2O$ in Gas Sample | TCD | | No. 84 |
| ASTM-D3798 | Impurities in p-Xylene | FID | | No. 170 |
| UOP-720 | Impurities in p-Xylene | FID | | No. 181 |
| UOP-931 | Trace Impurities in Xylenes | FID | | No. 187 |

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No.87

# System Gas Chromatograph

## Acetone and Propylene Aldehyde Analysis System
## Nexis GC-2030ALD
## GC-2014ALD

Return to Table

This instrument is designed for the determination of acetone and propylene aldehyde by gas chromatography (GC) with FID.
Samples are directly injected by AOC-20i, a WAX column performs the separation, with detection by FID. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
$CH_3COCH_3$, Propylene aldehyde

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH3COCH3 | 5ppm | 500ppm | FID |
| 2 | Propylene aldehyde | 5ppm | 500ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

### Typical Chromatograms

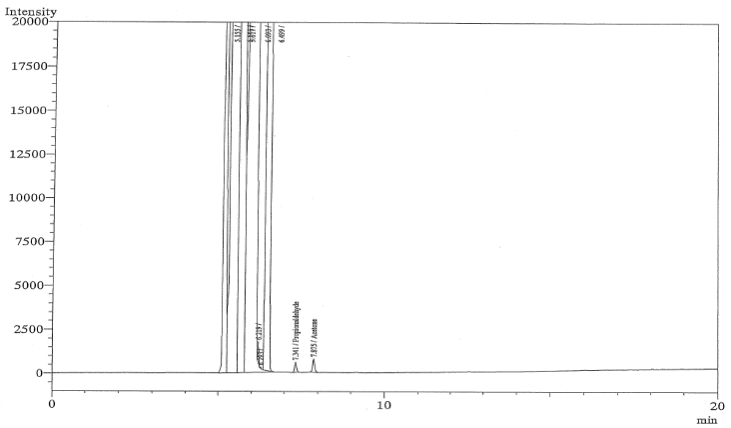


Fig. Chromatogram of FID

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No.169

System Gas Chromatograph

# Alcohol in Water Analysis
# Nexis GC-2030ALW
# GC-2014ALW

Return to Table

This method is for determining the composition of liquid as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID

**Sample Information:**
Methanol

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Methanol | 1 ppm | 1000 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

**Methods met:**
ASTM-D3695

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

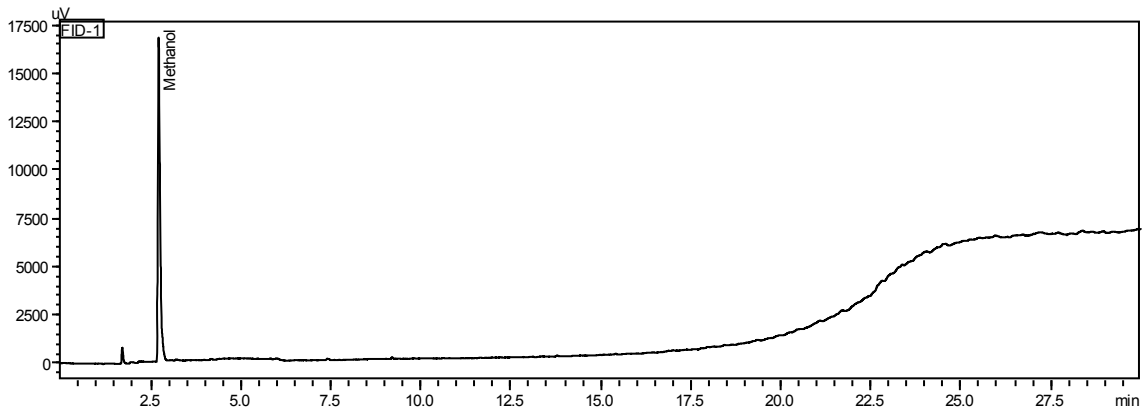


Fig. 1 Chromatogram of FID

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# System Gas Chromatograph

## Ammonia at Sulfur Recovery Unit in % Level Analysis System

## Nexis GC-2030$NH_3$
## GC-2014$NH_3$

Return to Table

This instrument is applicated for the analysis of ammonia (NH3) by gas chromatography (GC) and TCD using a Chromosorb103 packed column. The final analysis time is approximately 14 minutes. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
One valve / two packed columns with one TCD detector

**Sample Information:**
$NH_3$



**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | NH3 | 0.05% | 30% | TCD-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 15 minutes analysis for NH3 analysis can be carried out
- One TCD channel
- Good repeatability

### Typical Chromatograms

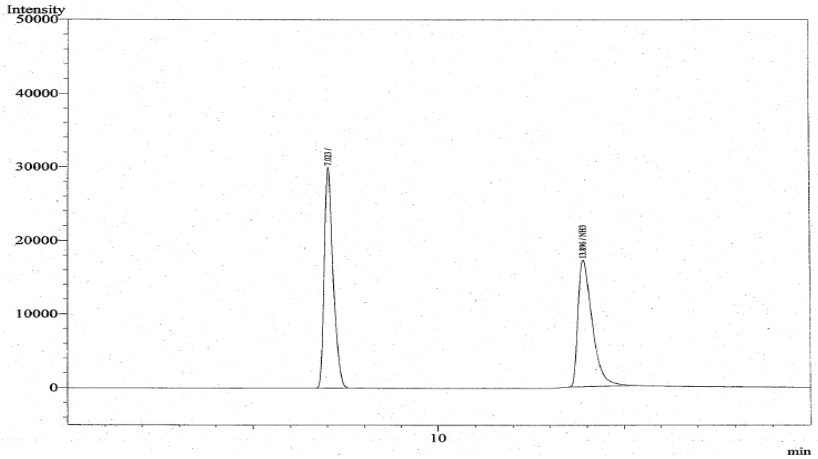


Fig. Chromatogram of TCD

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System Gas Chromatograph

# Trace Saturates in Pure Aromatics
# Nexis GC-2030TSHA1
# GC-2014TSHA1

Return to Table

This method is for determining trace paraffins and naphthenes by carbon number from C3 through C10 in olefin-free C6, C7 or C8 aromatics or mixtures. A repeatable sample volume is injected into a gas chromatograph equipped with two columns and a flame ionization detector. The first column is polar, packed with OV-275 on Chromosorb, and the second column is selective, packed with specially treated 13X molecular sieves. Initially, the two columns are connected in series. Immediately before the elution of benzene from the polar column, the polar column is back-flushed to vent while the eluted saturated hydrocarbons are analyzed on the selective column. The external standard method of quantitation is used. The system includes Lab Solutions GC workstation software.

## Analyzer Information

**System Configuration:**
Two valves/Two packed column with one FID detector

**Sample Information:**
C3~C8 Paraffins or Naphthenes, C9~C10 Paraffins or Naphthenes

**Methods met:**
UOP-868

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | C3~C8 Paraffins or Naphthenes | 2ppm | 2000ppm |
| 2 | C9~C10 Paraffins or Naphthenes | 100ppm | 2000ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

・70 minutes analysis can be carried out for the gasoline analysis
・Single channel with two packed column by using FID detector

## Typical Chromatograms

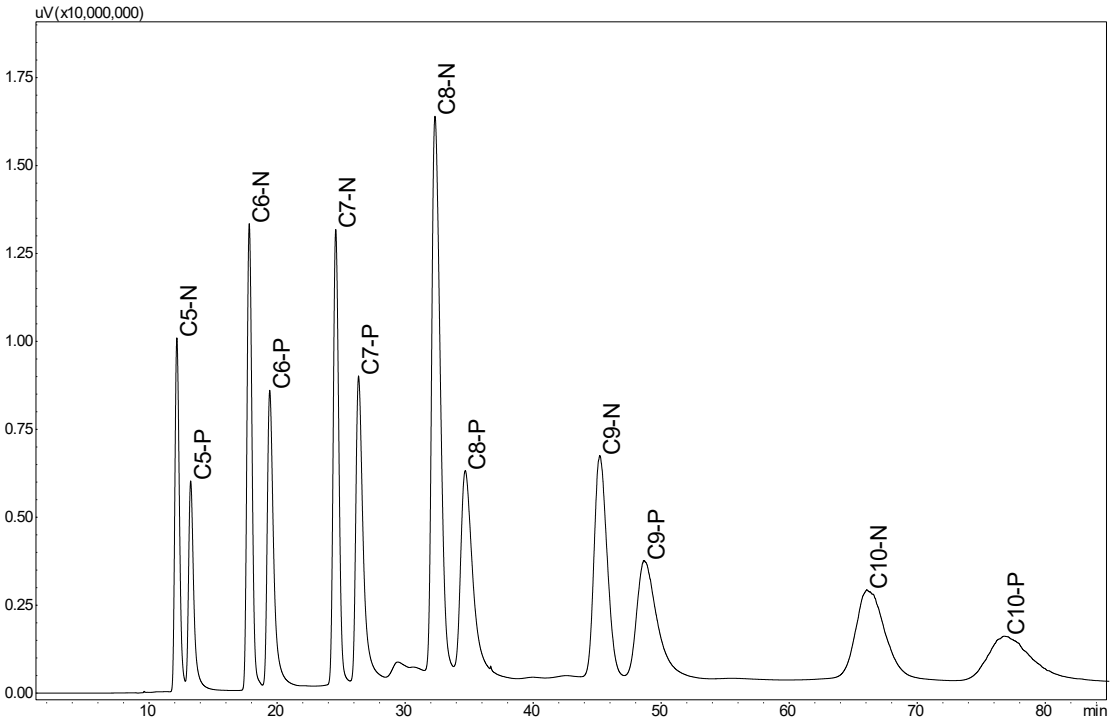


Fig. 1 Chromatogram of FID

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No.38

## System Gas Chromatograph

# Carbon Number Distribution of P-,N- and A- Nexis GC-2030CAD1 GC-2014CAD1

Return to Table

This is an automated method for determining the distribution of paraffins, naphthenes and aromatics by carbon number in hydrocarbon fractions having an endpoint of 200 ℃ or less (C3-C11). The sample is injected into a GC equipped with three packed columns and appropriate valving. The first column is polar, typically packed with OV-275 on Chromosorb; the second column is non-polar, typically packed with OV-101 on Chromosorb; and the third column is selective, typically packed with specially treated molecular sieves. Initially, the polar and selective columns are connected in series. After the elution of C11 saturates from the polar column, the polar column flow is stopped, holding the aromatics until the paraffins and naphthenes have eluted from the selective column. The aromatics are then eluted from the polar column in three fractions, each fraction being separated on the non-polar column. Internal normalization of peak areas after correction for difference in response is used to obtain a mass- or LV-% distribution of the components. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Two valves/Two packed column with one FID detector

**Sample Information:**
Single carbon number hydrocarbon type

**Methods met:**
UOP-870

**Concentration Range:**

| No.z | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Single carbon number hydrocarbon type | 0.05% (mass or liquid volume) | 3%(mass or liquid volume) |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- 100 minutes analysis can be carried out for the gasoline analysis.
- Single channel with dual packed column by using FID detector

## Typical Chromatograms

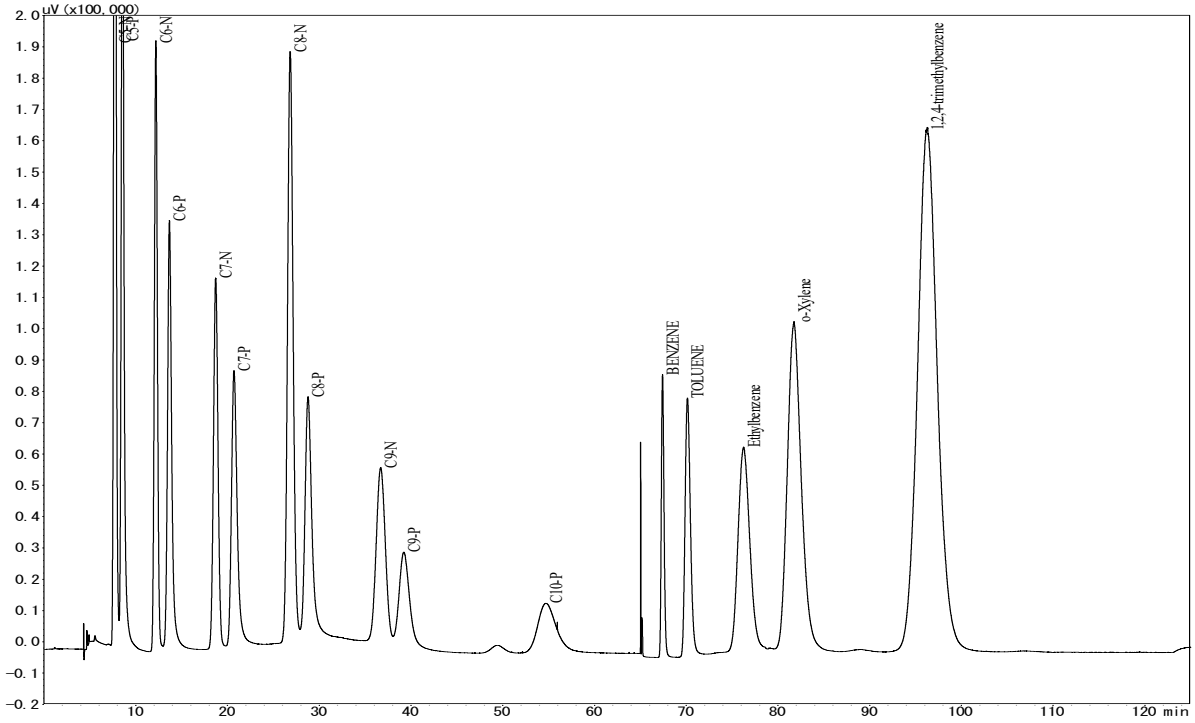


Fig. 1 Chromatogram of FID

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No.176

## System Gas Chromatograph

# Non-Aromatic Hydrocarbons in Aromatics
# Nexis GC-2030NAR
# GC-2014NAR

Return to Table

This system is for determining non-aromatic impurities in aromatics as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
C7 and higher boiling aromatics, or benzene and toluene in specific sample types

**Methods met:**
UOP-543

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non-aromatics | 1 ppm | 10,000 ppm |
| 2 | Benzene | 1 ppm | 10,000 ppm |
| 3 | Toluene | 1 ppm | 10,000 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Good repeatability

### Typical Chromatograms

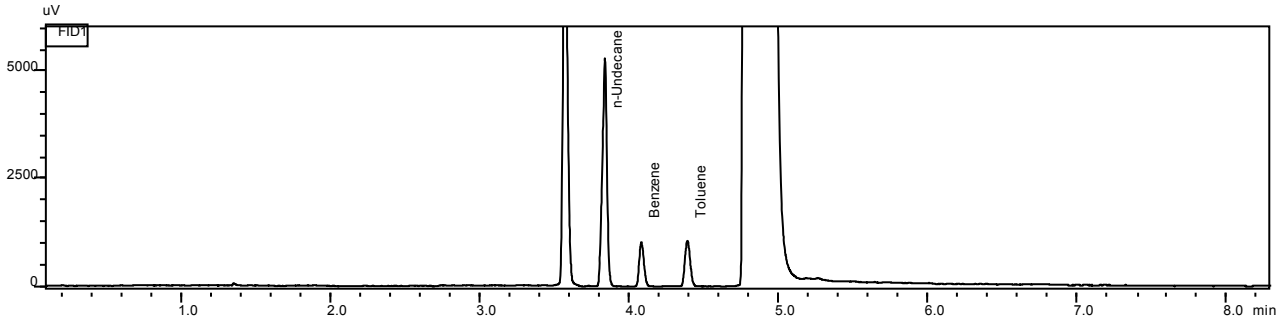


Fig. 1 Chromatogram of FID

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No.183

System Gas Chromatograph

# C10 or Lower Boiling Aromatics Analysis
# Nexis GC-2030ARO1
# GC-2014ARO1

Return to Table

This method is for determining the composition of C10 or lower boiling point Aromatics as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Methods met:**
UOP-744

**Sample Information:**
Determining individual C6 through C10 aromatic compounds in petroleum distillates or aromatic concentrates having a final boiling point of 210° C or lower.

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non-aromatics | 0.01 % | - |
| 2 | Benzene | 0.01 % | - |
| 3 | Toluene | 0.01 % | - |
| 4 | Ethylbenzene | 0.01 % | - |
| 5 | p-Xylene | 0.01 % | - |
| 6 | o-Xylene | 0.01 % | - |
| 7 | m-Xylene | 0.01 % | - |
| 8 | n-Propylbenzene | 0.01 % | - |
| 9 | 1-Methyl-2-ethylbenzene | 0.01 % | - |
| 10 | 1,3,5-Trimethylbenzene | 0.01 % | - |
| 11 | Styrene | 0.01 % | - |
| 12 | 1,2,4-Trimethylbenzene | 0.01 % | - |
| 13 | n-Butylbenzene | 0.01 % | - |
| 14 | 1,2-Dimethyl-4-ethylbenzene | 0.01 % | - |
| 15 | 1,2,4,5-Tetramethylbenzene | 0.01 % | - |
| 16 | Naphthalene | 0.01 % | - |
| 17 | Isopropylbenzene | 0.01 % | - |
| 18 | 1-Methyl-4-ethylbenzene | 0.01 % | - |
| 19 | 1-Methyl-3-ethylbenzene | 0.01 % | - |
| 20 | tert-Butylbenzene | 0.01 % | - |
| 21 | Isobutylbenzene | 0.01 % | - |
| 22 | sec-Butylbenzene | 0.01 % | - |
| 23 | 1-Methyl-3-isopropylbenzene | 0.01 % | - |

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 24 | 1-Methyl-4-isopropylbenzene | 0.01 % | - |
| 25 | 1,3-Diethylbenzene + 1-Methyl-2-isopropylbenzene | 0.01 % | - |
| 26 | 1-Methyl-3-n-propylbenzene | 0.01 % | - |
| 27 | 1-Methyl-4-n-propylbenzene | 0.01 % | - |
| 28 | 1,4-Diethylbenzene | 0.01 % | - |
| 29 | 1,3-Dimethyl-5-ethylbenzene | 0.01 % | - |
| 30 | 1,2-Diethylbenzene | 0.01 % | - |
| 31 | 1-Methyl-2-n-propylbenzene | 0.01 % | - |
| 32 | 1,2,3-Trimethylbenzene | 0.01 % | - |
| 33 | 1,4-Dimethyl-2-ethylbenzene | 0.01 % | - |
| 34 | 1,3-Dimethyl-4-ethylbenzene | 0.01 % | - |
| 35 | Indane | 0.01 % | - |
| 36 | 1,3-Dimethyl-2-ethylbenzene + 2-Methylindane | 0.01 % | - |
| 37 | 1-Methylindane | 0.01 % | - |
| 38 | 1,2-Dimethyl-3-ethylbenzene | 0.01 % | - |

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 39 | 1,2,3,5-Tetramethylbenzene | 0.01 % | - |
| 40 | 5-Methylindane | 0.01 % | - |
| 41 | 1,2,3,4-Tetramethylbenzene | 0.01 % | - |
| 42 | 4-Methylindane | 0.01 % | - |
| 43 | Tetraline | 0.01 % | - |
| 44 | 2-Methylnaphthalene | 0.01 % | - |
| 45 | 1-Methylnaphthalene | 0.01 % | - |
| 46 | C11+ Aromatics | 0.01 % | - |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

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## System Features

・Single FID channel
・Good repeatability

## Typical Chromatograms

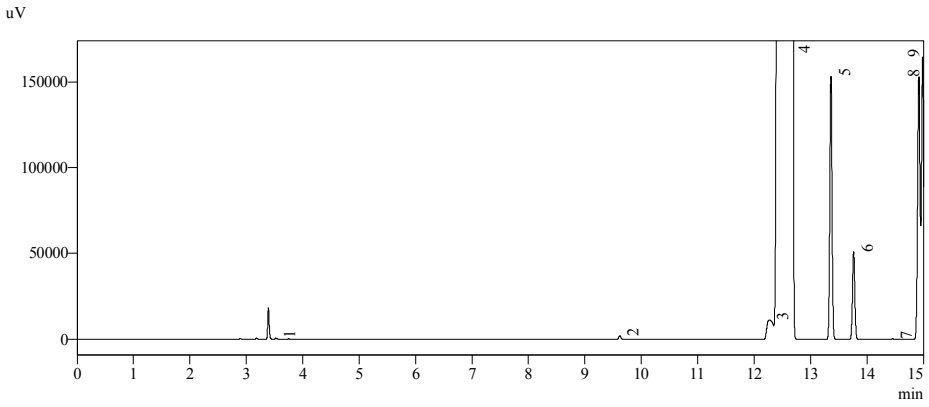


Fig. 1 Chromatogram of FID – 1 of 3

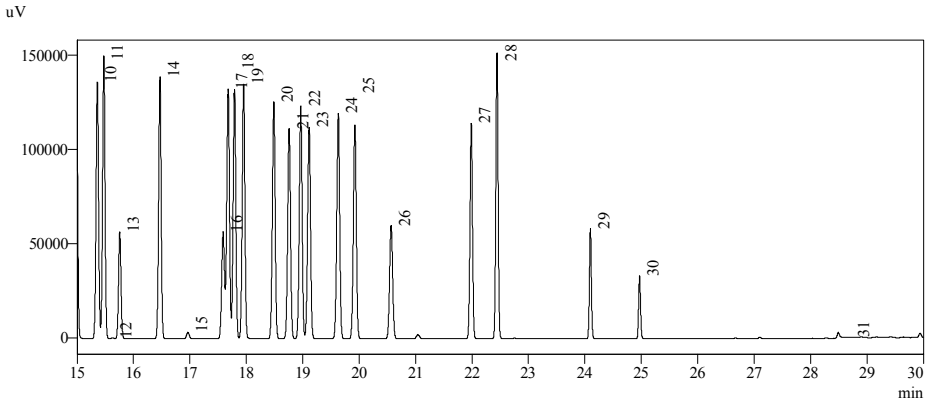


Fig. 2 Chromatogram of FID – 2 of 3

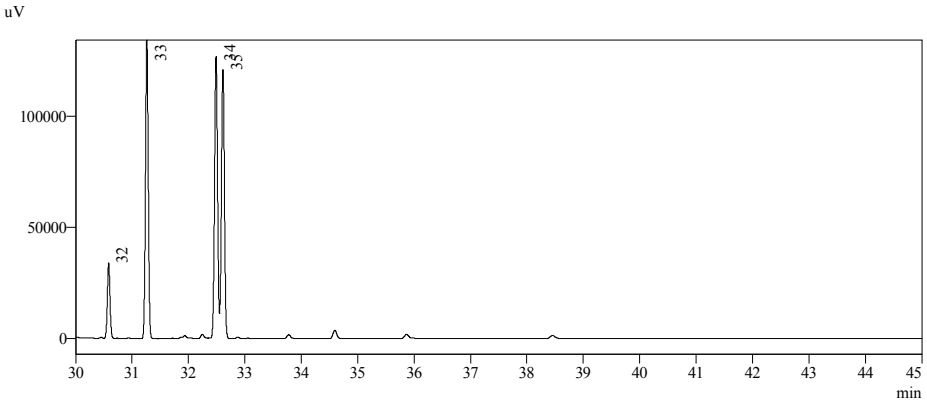


Fig. 3 Chromatogram of FID – 3 of 3

Return to Table

| ID# | Name | ID# | Name |
|---|---|---|---|
| 1 | n-Heptane | 19 | 1,4-Diethylbenzene |
| 2 | Toluene | 20 | 1,3-Dimethyl-5-ethylbenzene |
| 3 | p-Xylene | 21 | 1,2-Diethylbenzene |
| 4 | m-Xylene | 22 | 1-Methyl-2-n-propylbenzene |
| 5 | Isopropylbenzene | 23 | 1,2,3-Trimethylbenzene |
| 6 | o-Xylene | 24 | 1,4-Dimethyl-2-ethylbenzene |
| 7 | n-Propylbenzene | 25 | 1,3-Dimethyl-4-ethylbenzene |
| 8 | 1-Methyl-4-ethylbenzene | 26 | Indane |
| 9 | 1-Methyl-3-ethylbenzene | 27 | 1,2-Dimethyl-3-ethylbenzene |
| 10 | tert-Butylbenzene | 28 | 1,2,3,5-Tetramethylbenzene |
| 11 | Isobutylbenzene | 29 | 1,2,3,4-Tetramethylbenzene |
| 12 | 1,3,5-Trimethylbenzene | | |
| 13 | sec-Butylbenzene | | |
| 14 | 1-Methyl-4-isopropylbenzene | | |
| 15 | 1,2,4-Trimethylbenzene | | |
| 16 | 1,3-Diethylbenzene + 1-Methyl-2-isopropylbenzene | | |
| 17 | 1-Methyl-3-n-propylbenzene | | |
| 18 | 1-Methyl-4-n-propylbenzene | | |

Fig. 4 Compound List of The Chromatogram

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## System Gas Chromatograph

# p-DEB in C8 Aromatics Analysis
# Nexis GC-2030ARO2
# GC-2014ARO2

This method is for determining p-DEB in C8 and lower boiling aromatics as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

Return to Table

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
1,4-Diethylbenzene (p-DEB) in C8 and lower boiling aromatics

**Methods met:**
UOP-798

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | 1,4-Diethylbenzene (p-DEB) | 0.5 ppm | 1,000 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Good repeatability

### Typical Chromatograms

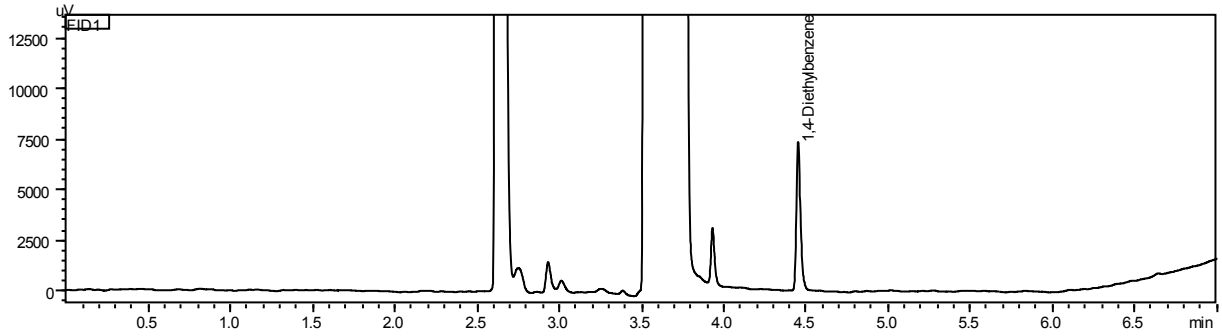


Fig. 1 Chromatogram of FID

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# System Gas Chromatograph

# Benzene in Hexane and 1-Hexene Analysis System
# Nexis GC-2030BZ
# GC-2014BZ

Return to Table

This instrument is designed for determining benzene in hexane and 1-hexene within the composition range shown in the specification sheet. A sample is directly injected by AOC-20i, and individually separated by a DB-1 column detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
Benzene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Benzene | 1ppm | 1000ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 7 minutes analysis for benzene analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

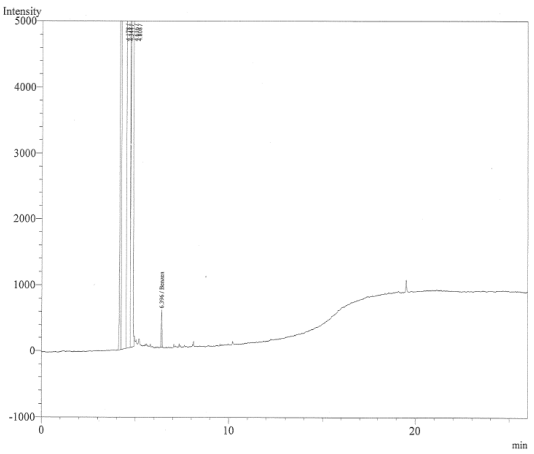


Fig. Chromatogram of FID

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## System Gas Chromatograph

# Impurities in Benzene Analysis
# Nexis GC-2030BZ2
# GC-2014BZ2

Return to Table

This method is for determining trace impurities in finished benzene as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

### Analyzer Information

**System Configuration:**
One SPL Injector / one capillary column / one FID

**Sample Information:**
Non-aromatics, Benzene, Toluene, Ethylbenzene, m-Xylene, o-Xylene, C9+ Aromatics, 1,4-Diethylbenzene, p-Xylene

**Methods met:**
ASTM-D4492

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non-aromatics | 0.002% | 2.000% |
| 2 | Benzene | 0.002% | 2.000% |
| 3 | Toluene | 0.002% | 2.000% |
| 4 | Ethylbenzene | 0.002% | 2.000% |
| 5 | m-Xylene | 0.002% | 2.000% |
| 6 | o-Xylene | 0.002% | 2.000% |
| 7 | C9+ Aromatics | 0.002% | 2.000% |
| 8 | 1,4-Diethylbenzene | 0.002% | 2.000% |
| 9 | p-Xylene | 98.000% | 100.000% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Good repeatability

### Typical Chromatograms

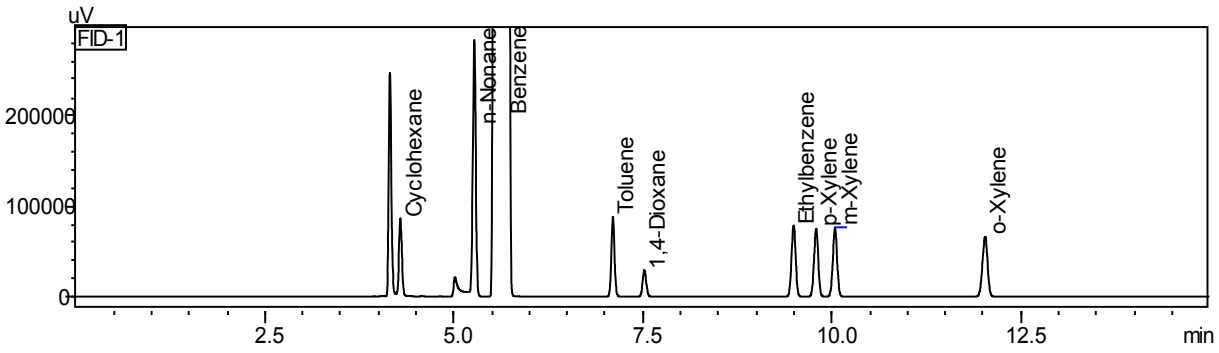


Fig. 1 Chromatogram of FID

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System Gas Chromatograph

# High Purity Benzene Analysis
# Nexis GC-2030BZ3
# GC-2014BZ3

This method is for determining the composition of specific impurities in high purity benzene for cyclohexane feedstock. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

Return to Table

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID

**Sample Information:**
Toluene, Methylcyclopentane, n-Hexane, 2-Methylhexane, Cyclohexane, Cyclopentane, 2-Methylpentane, 2,3-Dimethylpentane, 3-Methylhexane, n-Heptane, Methylcyclohexane, Ethylcyclopentane, 2,4-Dimethylhexane, Trimethylpentane, Benzene

**Methods met:**
ASTM-D5713

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Toluene | 2 ppm | 10,000 ppm |
| 2 | Methylcyclopentane | 2 ppm | 10,000 ppm |
| 3 | n-Hexane | 2 ppm | 10,000 ppm |
| 4 | 2-Methylhexane | 2 ppm | 10,000 ppm |
| 5 | Cyclohexane | 2 ppm | 10,000 ppm |
| 6 | Benzene | 0.1 % | 100 % |
| 7 | Cyclopentane | 2 ppm | 10,000 ppm |
| 8 | 2-Methylpentane | 2 ppm | 10,000 ppm |
| 9 | 2,3-Dimethylpentane | 2 ppm | 10,000 ppm |
| 10 | 3-Methylhexane | 2 ppm | 10,000 ppm |
| 11 | n-Heptane | 2 ppm | 10,000 ppm |
| 12 | Methylcyclohexane | 2 ppm | 10,000 ppm |
| 13 | Ethylcyclopentane | 2 ppm | 10,000 ppm |
| 14 | 2,4-Dimethylhexane | 2 ppm | 10,000 ppm |
| 15 | Trimethylpentane | 2 ppm | 10,000 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

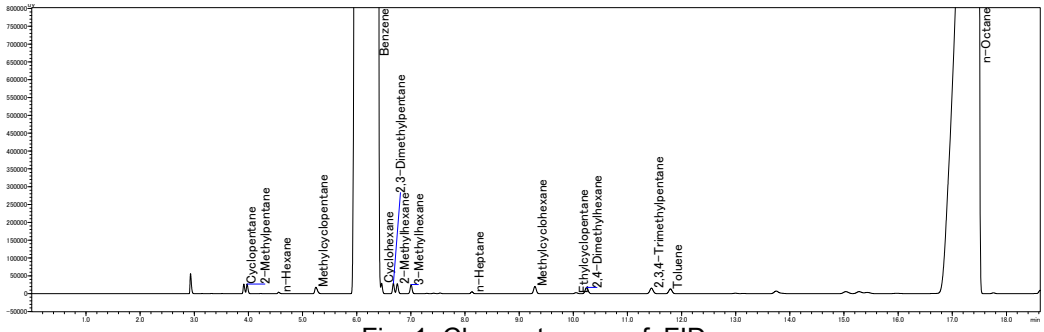


Fig. 1 Chromatogram of FID

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# System Gas Chromatograph

# Trace Hydrocarbons in Butene-1 Analysis System
# Nexis GC-2030THC
# GC-2014THC

Return to Table

This instrument is designed for determining trace hydrocarbons within the composition range shown in the specification sheet. A total of 1 valve and 1 column are used in this GC system. The sample is loaded into one sample loop for determination.
The valve timing then allows the trace hydrocarbons to be separated individually by a PLOT-Al2O3/KCl column and to be detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One valve / one capillary column with one FID detector

**Sample Information:**
C1-C5,VA,EA, 3-Methyl-1,2-Butadiene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 1ppm | 10% | FID |
| 2 | C2H6 | 1ppm | 10% | FID |
| 3 | C2H4 | 1ppm | 10% | FID |
| 4 | C2H2 | 1ppm | 10% | FID |
| 5 | C3H8 | 5ppm | 50ppm | FID |
| 6 | C3H6 | 5ppm | 50ppm | FID |
| 7 | i-C4H10 | 100ppm | 7000ppm | FID |
| 8 | n-C4H10 | 100ppm | 7000ppm | FID |
| 9 | 1,3-C4H6 | 2ppm | 10ppm | FID |
| 10 | 1,3-C5H8 | 1ppm | 10% | FID |
| 11 | VA | 1ppm | 10% | FID |
| 12 | EA | 1ppm | 10% | FID |
| 13 | 1,2-C5H8 | 1ppm | 10% | FID |
| 14 | 3-Methyl-1,2-Butadiene | 1ppm | 10% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

## Typical Chromatograms

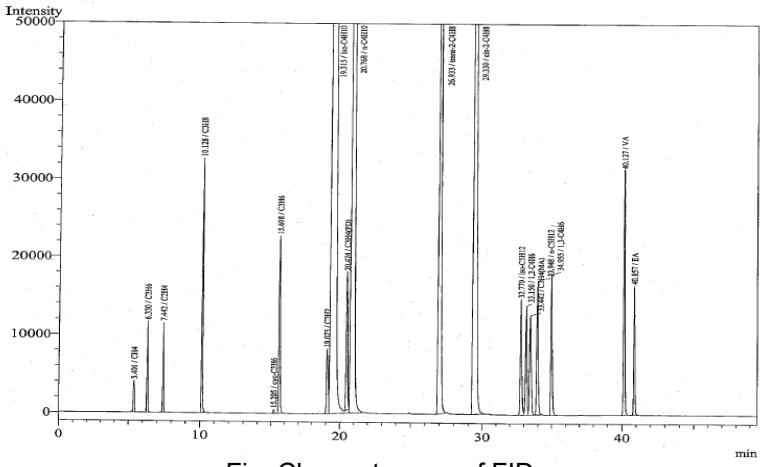


Fig. Chromatogram of FID

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No.111

# System Gas Chromatograph

# Isobutylene in 1-Butene Analysis System Nexis GC-2030PlusIBY GC-2014IBY

Return to Table

This GC is designed to measure isobutylene in 1-Butene. Two valves and two columns are used to create this GC system. The sample is separated by a DB-1 column and is detected by FID. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
Two valves / two packed column with one FID detector

**Sample Information:**
Isobutylene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Isobutylene | 1ppm | 2000ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 24 minutes analysis for Isobutylene analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

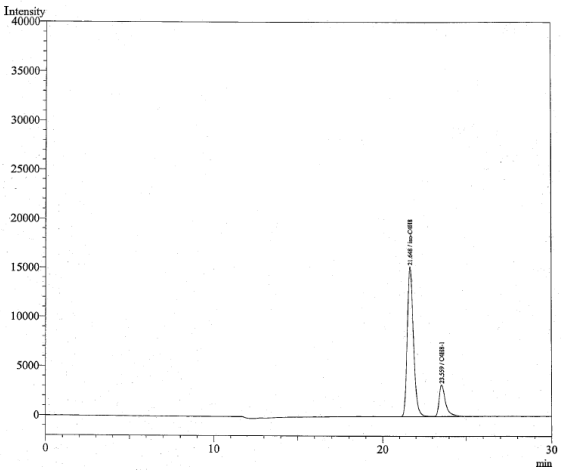


Fig. Chromatogram of FID

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# System Gas Chromatograph

# 1-Butene in Hexane Analysis System
# Nexis GC-2030BTE
# GC-2014BTE

Return to Table

This GC is designed to measure 1-Butene in hexane. The liquid sample is injected by AOC-20i to start the analysis. The sample is separated by a DB-1 column is detected by FID. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
1-Butene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | 1-Butene | 5ppm | 50ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 9 minutes analysis for 1-Butene analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

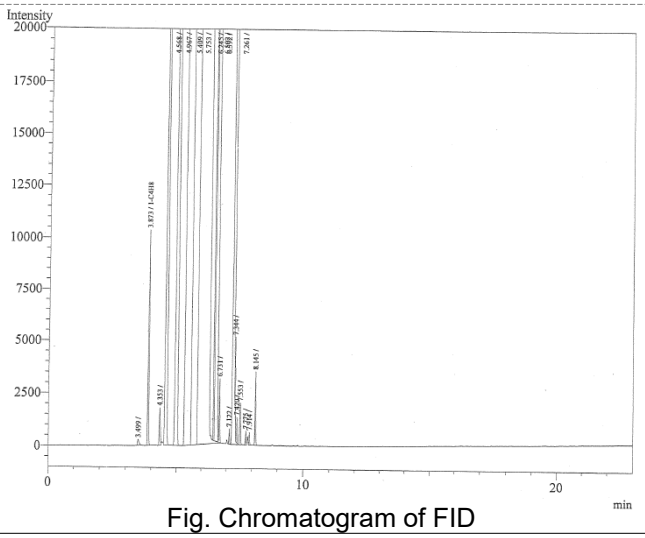


Fig. Chromatogram of FID

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## System Gas Chromatograph

# Hydrocarbons in Propylene Analysis System Nexis GC-2030HC

Return to Table

This system is designed for quantitative and qualitative analysis of Hydrocarbons in propylene. A total of 1 valve and 2 columns are applied in this GC system. Sample is introduced into one sample loop or directly injected into SPL for determination. Using a plot Al2O3/KCl and a CP-SILICA plot as main column, Hydrocarbons elute to a TCD. LabSolution chromatography workstation system handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
One valve / two capillary columns with two FID detectors

**Sample Information:**
C1-C3,VA,EA,1,3-C5H8,1,2-C5H8, 3-Methyl-1,2-Butadiene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 5.0ppm | 100.0ppm | FID |
| 2 | C2H6 | 5.0ppm | 200.0ppm | FID |
| 3 | C2H4 | 1.0ppm | 10.0ppm | FID |
| 4 | C3H8 | 5.0ppm | 100.0ppm | FID |
| 5 | C2H2 | 0.1ppm | 10% | FID |
| 6 | VA | 1.0ppm | 10% | FID |
| 7 | EA | 1.0ppm | 10% | FID |
| 8 | 1,2-C5H8 | 1.0ppm | 10% | FID |
| 9 | 1,3-C5H8 | 1.0ppm | 10% | FID |
| 10 | 3-Methyl-1,2-Butadiene | 1.0ppm | 10% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 40 minutes analysis for hydrocarbons analysis can be carried out
- Two FID channels
- Good repeatability

## Typical Chromatograms

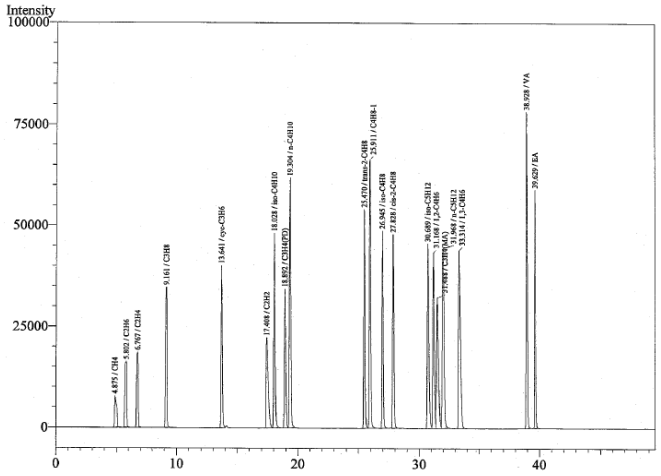


Fig. 1 Chromatogram of FID-1

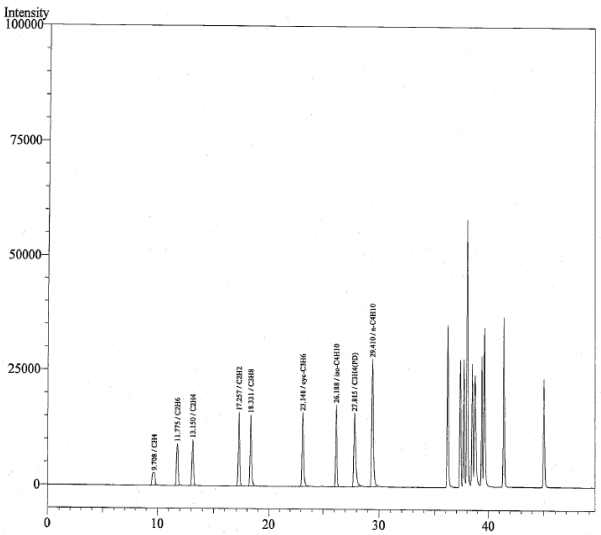


Fig. 2 Chromatogram of FID-2

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# System Gas Chromatograph

## Trace Chlorinated Hydrocarbons in $O_2$ Analysis System
## Nexis GC-2030CHC
## GC-2014CHC

Return to Table

This instrument is applicated for the determination of chlorinated hydrocarbons in O2 by gas chromatography (GC) and ECD. The sample is introduced into the analytical flowpath using a sample loop. A DC-200/550 column separates Trichloro-ethylene and 1,1,1-Trichloroethylene into and detected by ECD. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
Two valves / two packed columns with one ECD detector

**Sample Information:**
Trichloroethylene,1,1,1- Trichloroethylene

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Trichloroethylene | 50ppb | 0.1% | ECD |
| 2 | 1,1,1-Trichloroethylene | 50ppb | 0.1% | ECD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- 12 minutes analysis for 1,1,1- Trichloroethylene analysis can be carried out
- One ECD channels
- Good repeatability

### Typical Chromatograms

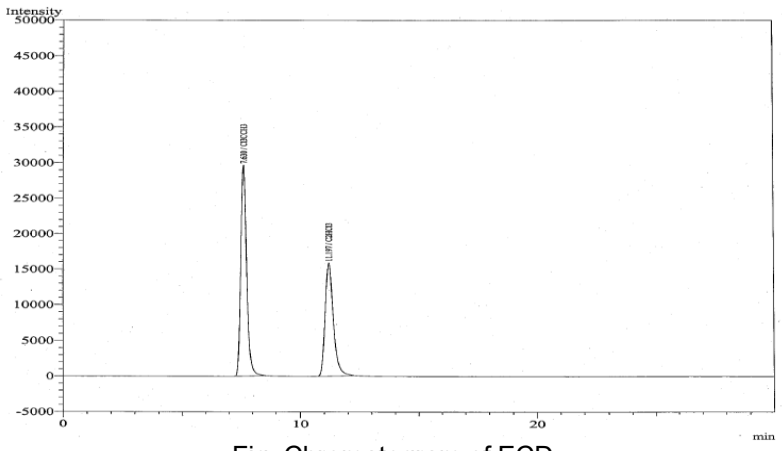


Fig. Chromatogram of ECD

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# System Gas Chromatograph

## Ethylene Oxide in MEG Unit Gas and Liquid Stream Samples Analysis System

## Nexis GC-2030EO
## GC-2014EO

Return to Table

This instrument is applicated for the determination of ethylene oxide in MEG gas and liquid stream samples by gas chromatography (GC) and detection by TCD or FID. The sample is introduced into one sample loop or directly injected into a packed injection port. The separations are performed by a Porapak-Q and Porapak-N columns. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
One valve / three packed columns with one TCD detector or one valve / three packed columns with two FID detectors

**Sample Information:**
EO

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | EO | 0.1% | 30.0% | TCD-1 |
| 2 | EO | 1.0ppm | 100.0ppm | FID-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One TCD channel or one FID channel
- Good repeatability

### Typical Chromatograms

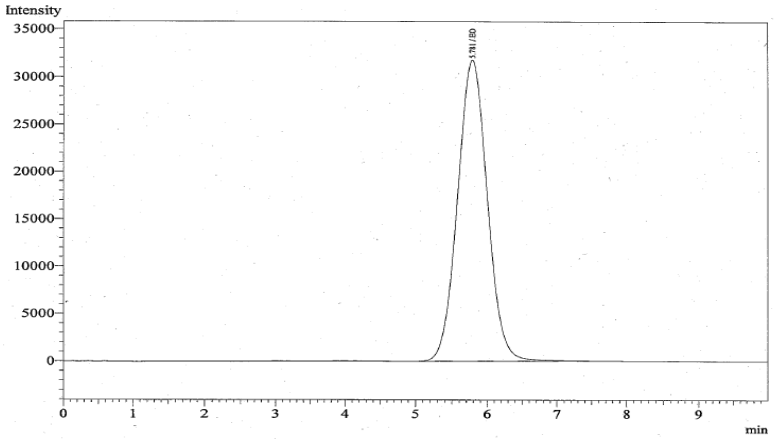


Fig. Chromatogram of TCD

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# System Gas Chromatograph

# Ethylene Glycol Composition Analysis System
# Nexis GC-2030EG
# GC-2014EG

Return to Table

This instrument is applicated for the determination of ethylene glycol by gas chromatography (GC) with FID. A DB-WAX column, separates MEG, DEG, TEG and TTEG for detection by FID. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
MEG,DEG,TEG,TTEG

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | MEG | 10.0% | 95.0% | FID |
| 2 | DEG | 0.3% | 80.0% | FID |
| 3 | TEG | 0.2% | 98.0% | FID |
| 4 | TTEG | 0.2% | 2.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 10 minutes analysis for MEG,DEG,TEG and TTEG analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

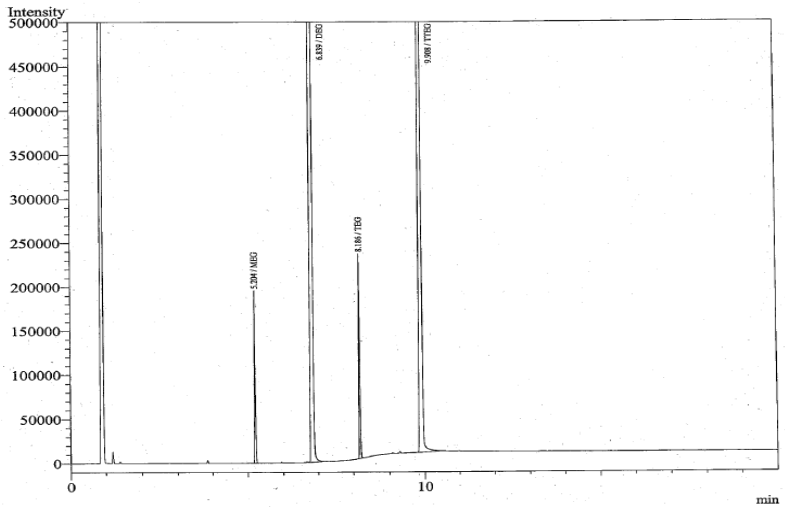


Fig. Chromatogram of FID

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# System Gas Chromatograph

# EO, EC, Glycol in MEG Analysis System
# Nexis GC-2030EOEC
# GC-2014EOEC

Return to Table

This instrument is designed for determining EO, EC, Glycol in MEG within the composition range shown in the specification sheet. The sample is directly injected by the AOC-20i, and separated on a WAX column and detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
EO, EC, DEG, TEG, TTEG

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | EO | 25ppm | 1000ppm | FID |
| 2 | EC | 25ppm | 1000ppm | FID |
| 3 | DEG | 25ppm | 1000ppm | FID |
| 4 | TEG | 25ppm | 1000ppm | FID |
| 5 | TTEG | 25ppm | 1000ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 30 minutes analysis for EO, EC, DEG, TEG and TTEG analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

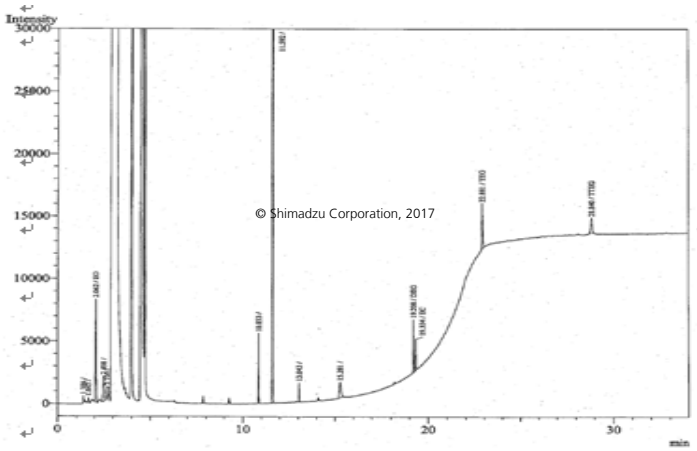


Fig. Chromatogram of FID

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# System Gas Chromatograph

# EC, DEG, TEG, TTEG in MEG Analysis System
# Nexis GC-2030EGEC
# GC-2014EGEC

Return to Table

This GC is designed for determining EC, DEG, TEG, TTEG in MEG within the composition range shown in the specification sheet. The sample is directly injected by AOC-20i, separation is performed by a DB-WAX column and detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

## Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
EO,EC,DEG,TEG,TTEG

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | EO | 10ppm | 1000ppm | FID |
| 2 | EC | 10ppm | 1000ppm | FID |
| 3 | DEG | 10ppm | 1000ppm | FID |
| 4 | TEG | 10ppm | 1000ppm | FID |
| 5 | TTEG | 10ppm | 1000ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

## Typical Chromatograms

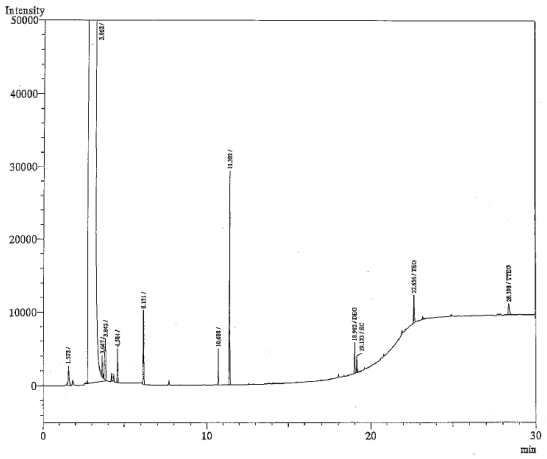


Fig. Chromatogram of FID

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No.180

# System Gas Chromatograph

## Octans and Lower Boiling Hydrocarbons in Olefin-Free Gasolines

## Nexis GC-2030LBH3

Return to Table

This system is for determining the composition of C8 or lower boiling paraffins and naphthenes in olefin-free gasolines. Detailed identification is enabled by comparing chromatograms of two different analytical conditions.

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID

**Methods met:**
UOP-690

### System Features

- Single FID channel
- Good repeatability
- Detailed hydrocarbon analysis with simple configuration
- Dedicated software for supporting identification

### Typical Chromatograms

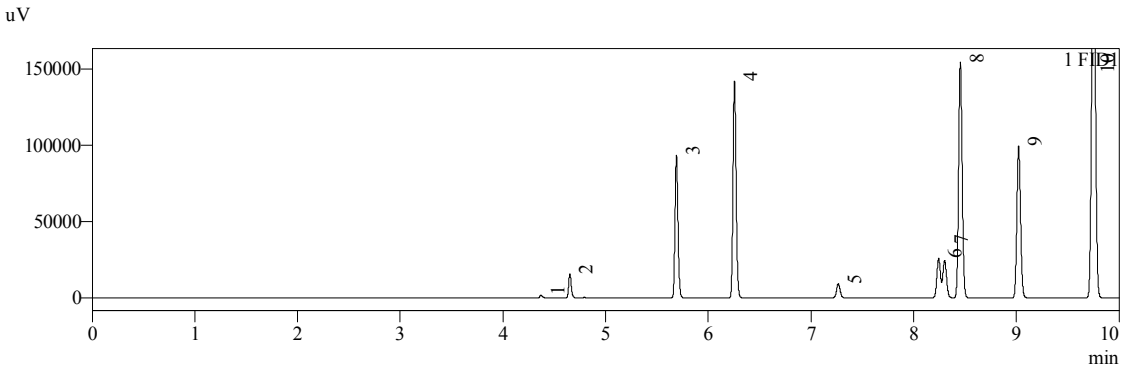


Fig. 1 Chromatogram of FID - 1 of 4

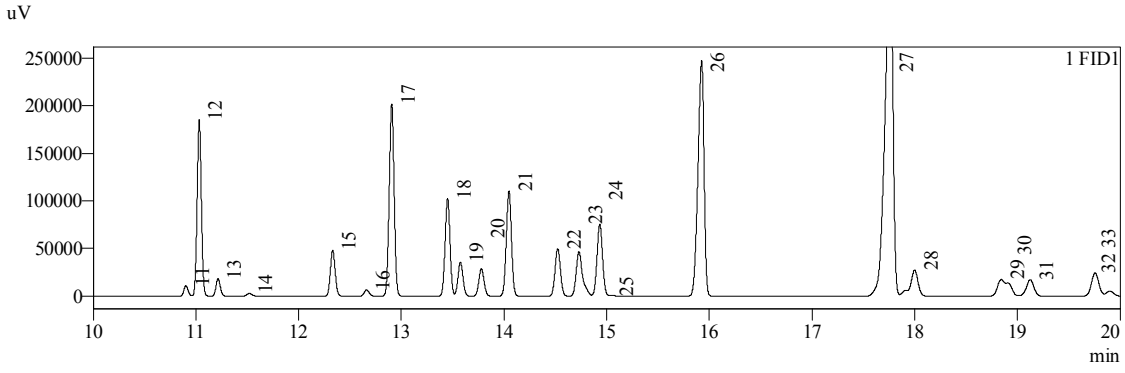


Fig. 2 Chromatogram of FID - 2 of 4

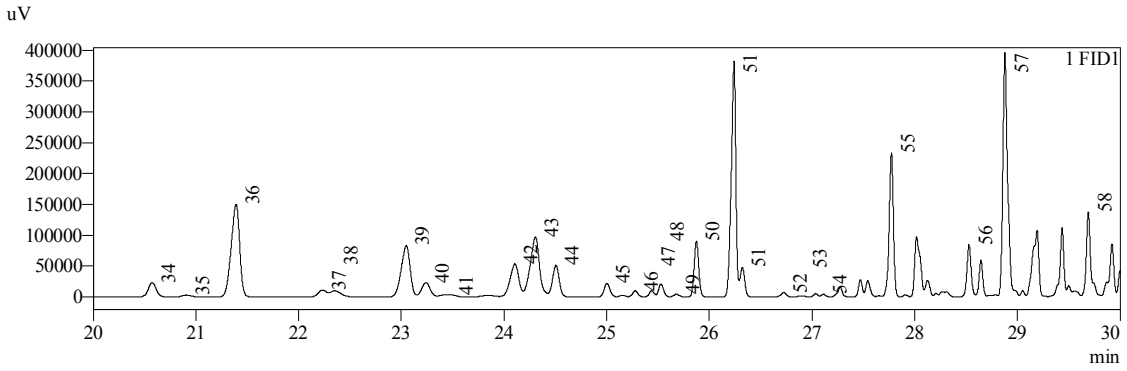


Fig. 3 Chromatogram of FID - 3 of 4

Return to Table

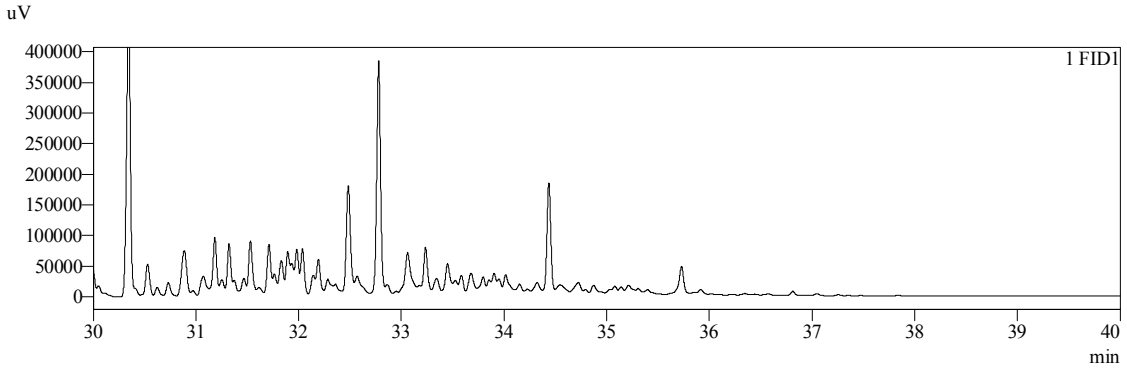


Fig. 4 Chromatogram of FID - 4 of 4

| ID# | Name | ID# | Name |
|---|---|---|---|
| 1 | Isobutane | 30 | 2,5-Dimethylhexane |
| 2 | n-Butane | 31 | 2,2,3-Trimethylpentane + 2,4-Dimethylhexane |
| 3 | Isopentane | 32 | 1-trans-2-cis-4-Trimethylcyclopentane |
| 4 | n-Pentane | 33 | 3,3-Dimethylhexane |
| 5 | 2,2-Dimethylbutane | 34 | 1-trans-2-cis-3-Trimethylcyclopentane |
| 6 | Cyclopentane | 35 | 2,3,4-Trimethylpentane |
| 7 | 2,3-Dimethylbutane | 36 | 2,3,3-Trimethylpentane + Toluene |
| 8 | 2-Methylpentane | 37 | 2,3-Dimethylhexane + 1,1,2-Trimethylcyclopentane |
| 9 | 3-Methylpentane | 38 | 2-Methyl-3-ethylpentane |
| 10 | n-Hexane | 39 | 2-Methylheptane |
| 11 | 2,2-Dimethylpentane | 40 | 4-Methylheptane |
| 12 | Methylcyclopentane | 41 | 3,4-Dimethylhexane + 3-Methyl-3-ethylpentane |
| 13 | 2,4-Dimethylpentane | 42 | 3-Methylheptane |
| 14 | 2,2,3-Trimethylbutane | 43 | 3-Ethylhexane + 1-cis-3-Dimethylcyclohexane + 1-cis-2-trans-3-Trimethylcyclopentane |
| 15 | Benzene | 44 | 1-trans-4-Dimethylcyclohexane |
| 16 | 3,3-Dimethylpentane | 45 | 1,1-Dimethylcyclohexane |
| 17 | Cyclohexane | 46 | 1-Methyl-trans-3-ethylcyclopentane |
| 18 | 2-Methylhexane | 47 | 1-Methyl-cis-3-ethylcyclopentane |
| 19 | 2,3-Dimethylpentane | 48 | 1-Methyl-trans-2-ethylcyclopentane |
| 20 | 1,1-Dimethylcyclopentane | 49 | 1-Methyl-1-ethylcyclopentane |
| 21 | 3-Methylhexane | 50 | 1-trans-2-Dimethylcyclohexane |
| 22 | 1-trans-3-Dimethylcyclopentane | 51 | n-Octane + 1-cis-4-Dimethylcyclohexane + 1-trans-3-Dimethylcyclohexane |
| 23 | 3-Ethylpentane | 52 | Isopropylcyclopentane |
| 24 | 1-trans-2-Dimethylcyclopentane | 53 | 1-Methyl-cis-2-ethylcyclopentane |
| 25 | 2,2,4-Trimethylpentane | 54 | 1-cis-2-Dimethylcyclohexane |
| 26 | n-Heptane | 55 | n-Propylcyclopentane + Ethylcyclohexane |
| 27 | Methylcyclohexane + 1-cis-2-Dimethylcyclopentane | 56 | Ethylbenzene |
| 28 | 1,1,3-Trimethylcyclopentane + 2,2-Dimethylhexane | 57 | m-Xylene + p-Xylene |
| 29 | Ethylcyclopentane | 58 | o-Xylene |

Fig. 5 Compound List of the Chromatogram

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# System Gas Chromatograph

# Lower Boiling Hydrocarbons in Olefinic Gasolines
# Nexis GC-2030LBH2
# GC-2014LBH2

Return to Table

This method is for determining low boiling hydrocarbons in olefinic gasoline as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
Determining C5 and lighter paraffins and mono olefins in olefinic gasolines having a final boiling point of 260℃ or lower.

**Methods met:**
UOP 725

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Propane + Propylene | 500 ppmwt | 10,000 ppmwt |
| 2 | Isobutane | 500 ppmwt | 10,000 ppmwt |
| 3 | 1-Butene | 500 ppmwt | 10,000 ppmwt |
| 4 | Isobutylene | 500 ppmwt | 10,000 ppmwt |
| 5 | n-Butane | 500 ppmwt | 10,000 ppmwt |
| 6 | trans-2-Butene | 500 ppmwt | 10,000 ppmwt |
| 7 | cis-2-Butene | 500 ppmwt | 10,000 ppmwt |
| 8 | 3-Methyl-1-butene | 500 ppmwt | 10,000 ppmwt |
| 9 | Isopentane | 500 ppmwt | 10,000 ppmwt |
| 10 | 1-Pentene | 500 ppmwt | 10,000 ppmwt |
| 11 | 2-Methyl-1-butene | 500 ppmwt | 10,000 ppmwt |
| 12 | n-Pentane | 500 ppmwt | 10,000 ppmwt |
| 13 | trans-2-Pentene | 500 ppmwt | 10,000 ppmwt |
| 14 | cis-2-Pentene | 500 ppmwt | 10,000 ppmwt |
| 15 | 2-Methyl-2-butene | 500 ppmwt | 10,000 ppmwt |
| 16 | Benzene | 500 ppmwt | 10,000 ppmwt |
| 17 | Toluene | 500 ppmwt | 10,000 ppmwt |
| 18 | Ethylbenzene | 500 ppmwt | 10,000 ppmwt |
| 19 | m,p-Xylene | 500 ppmwt | 10,000 ppmwt |
| 20 | o-Xylene | 500 ppmwt | 10,000 ppmwt |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

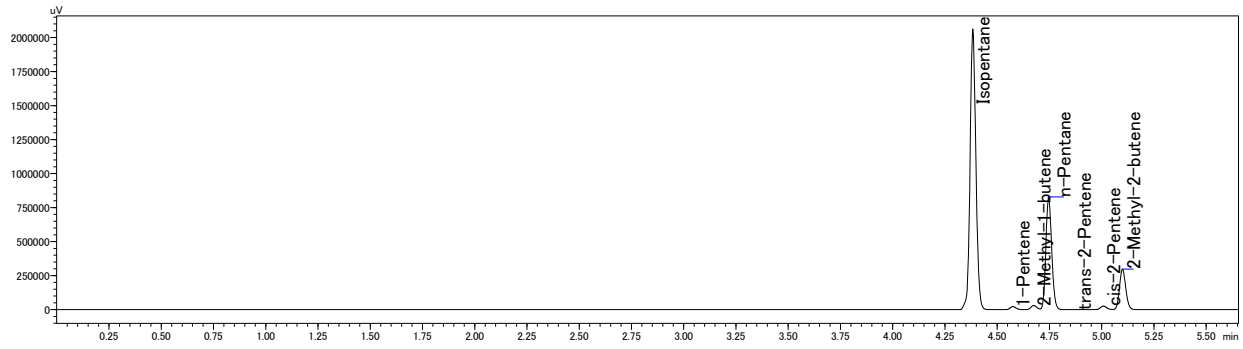


Fig. 1 Chromatogram of FID - 1 of 2

Return to Table

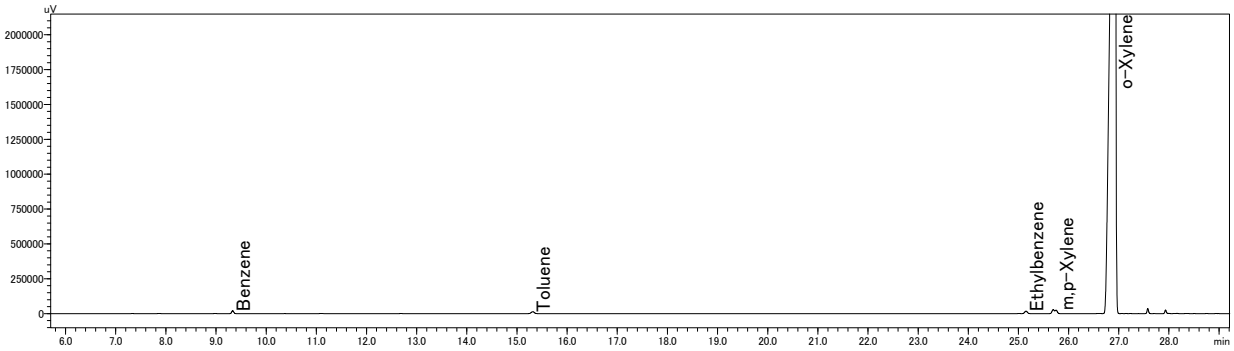


Fig. 2 Chromatogram of FID - 2 of 2

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No.168

## System Gas Chromatograph

# Gases in C2 Analysis
# Nexis GC-2030HC3
# GC-2014HC3

Return to Table

This system is for determining hydrogen, oxygen, nitrogen and methane in propylene in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic sampling and backflush technique in multiple columns.

### Analyzer Information

**System Configuration:**
Two valves / two packed columns / one PDHID

**Sample Information:**
Determining hydrogen, oxygen, nitrogen and methane in propylene

**Methods met:**
ASTM-D2504

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Hydrogen | 1ppm | 15ppm |
| 2 | Oxygen + Argon | 1ppm | 150ppm |
| 3 | Nitrogen | 1ppm | 150ppm |
| 4 | Methane | 1ppm | 150ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Suited for trace impurities in gas sample
- Versatile software easy GC system operation

### Typical Chromatograms

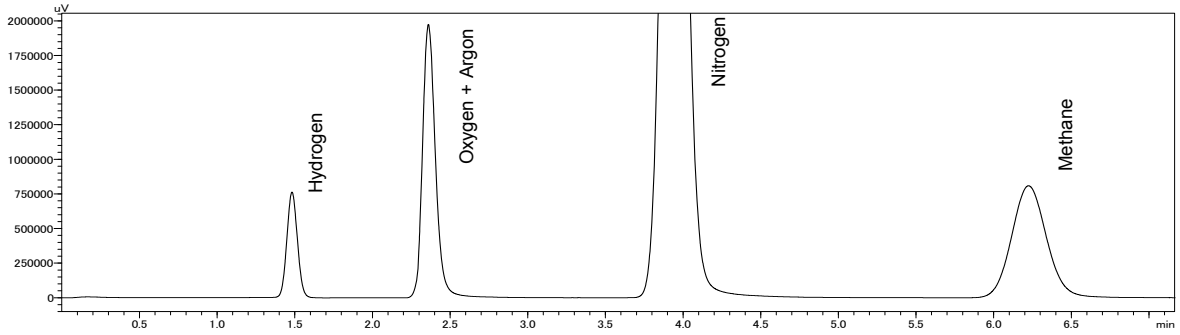


Fig. 1 Chromatogram of PDHID

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# System Gas Chromatograph

# Hydrocarbon Gas Analysis System Nexis GC-2030HCG1 GC-2014HCG1

Return to Table

This method is for determining the hydrocarbons within the composition range shown in the specification sheet. A total of 1 valves and 1 capillary column are applied in this GC system. Sample is introduced into the sample loop and transferred to split/splitless injector, separated by Alumina capillary column and detected by FID. The analysis time is approximately 30 minutes. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
One valve / one capillary column with one FID detector

**Sample Information:**
C1-C6

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | CH4 | 0.010% | 80.0% | FID |
| 2 | C2H4 | 0.010% | 10.0% | FID |
| 3 | C2H6 | 0.010% | 10.0% | FID |
| 4 | C2H2 | 0.010% | 10.0% | FID |
| 5 | C3H8 | 0.001% | 5.0% | FID |
| 6 | C3H6 | 0.001% | 5.0% | FID |
| 7 | i-C4H10 | 0.001% | 1.0% | FID |
| 8 | n-C4H10 | 0.001% | 1.0% | FID |
| 9 | Propadiene(C3H4) | 0.001% | 1.0% | FID |
| 10 | Trans-C4H8 | 0.001% | 0.5% | FID |
| 11 | 1-C4H8 | 0.001% | 0.5% | FID |
| 12 | i-C4H8 | 0.001% | 0.5% | FID |
| 13 | Cis-2-C4H8 | 0.001% | 0.5% | FID |
| 14 | i-C5H12 | 0.001% | 0.5% | FID |
| 15 | n-C5H12 | 0.001% | 0.5% | FID |
| 16 | 1,3-C4H6 | 0.001% | 0.5% | FID |
| 17 | C3H4 | 0.001% | 0.5% | FID |
| 18 | C6+ | 0.001% | 1.0% | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One FID channel
- Good repeatability

## Typical Chromatograms

Return to Table

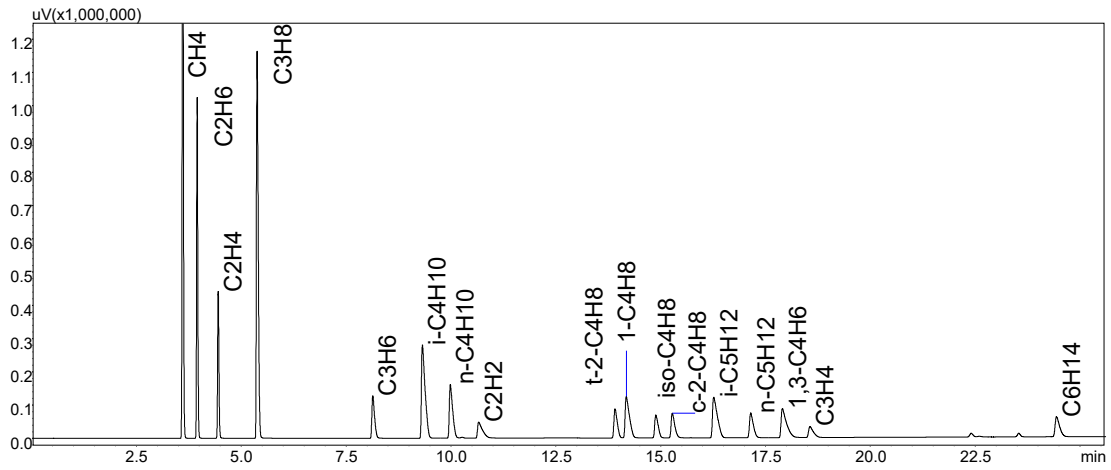


Fig. Chromatogram of FID

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# System Gas Chromatograph

## C6 and Lower Boiling Hydrocarbons in Olefin Free Naphthas

## Nexis GC-2030LBH1
## GC-2014LBH1

This method is for determining the composition of olefin free Naphtha as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

Return to Table

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
Determining benzene, individual hexanes and lower boiling hydrocarbons in olefin free naphthas having a final boiling point of 260˚C or lower.

**Methods met:**
UOP-551

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Propane | 100 ppmwt | 10,000 ppmwt |
| 2 | Isobutane | 100 ppmwt | 10,000 ppmwt |
| 3 | n-Butane | 100 ppmwt | 10,000 ppmwt |
| 4 | Isopentane | 100 ppmwt | 50 %wt |
| 5 | n-Pentane | 100 ppmwt | 40 %wt |
| 6 | 2,2-Dimethylbutane | 100 ppmwt | 10 %wt |
| 7 | Cyclopentane | 100 ppmwt | 10,000 ppmwt |
| 8 | 2,3-Dimethylbutane | 100 ppmwt | 10 %wt |
| 9 | 2-Methylpentane | 100 ppmwt | 40 %wt |
| 10 | 3-Methylpentane | 100 ppmwt | 30 %wt |
| 11 | n-Hexane | 100 ppmwt | 20 %wt |
| 12 | Methylcyclopentane | 100 ppmwt | 10 %wt |
| 13 | Benzene | 100 ppmwt | 10 %wt |
| 14 | Cyclohexane | 100 ppmwt | 10,000 ppmwt |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Good repeatability

### Typical Chromatograms

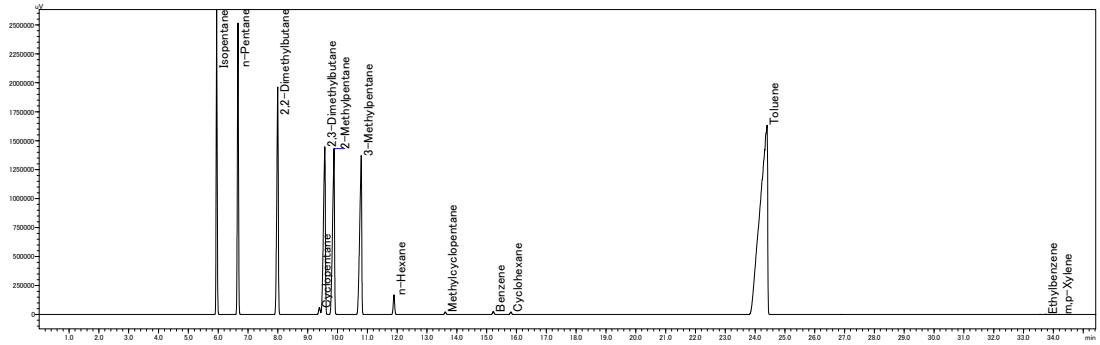


Fig. 1 Chromatogram of FID

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No.179

# System Gas Chromatograph

## Boiling Point Distributions of Liquid Hydrocarbons
## Nexis GC-2030BPD
## GC-2014BPD

Return to Table

This system is for analyzing liquid hydrocarbons in the range of C5 through C20. Sample is characterized by boiling point distribution with methyl silicone capillary column. Dedicated software supports classifying each hydrocarbon peak groups.

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
Liquid hydrocarbons in the range of C5 through C20

**Methods met:**
UOP-621

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | C5 Non-aromatics | 500 ppmwt | 99.9 %wt |
| 2 | Benzene | 500 ppmwt | 99.9 %wt |
| 3 | Toluene | 500 ppmwt | 99.9 %wt |
| 4 | C8 Aromatics | 500 ppmwt | 99.9 %wt |
| 5 | C10 Aromatics | 500 ppmwt | 99.9 %wt |
| 6 | Naphthalene | 500 ppmwt | 99.9 %wt |
| 7 | C12 Aromatics | 500 ppmwt | 99.9 %wt |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Dedicated calculation software for grouping

### Typical Chromatograms

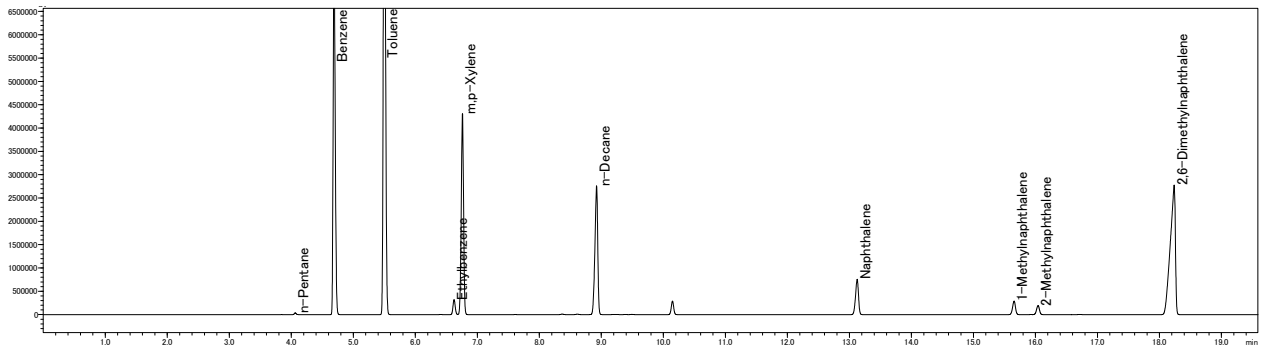


Fig. 1 Chromatogram of FID

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No.186

## System Gas Chromatograph

# Trace Hydrocarbons in LPG Analysis
# Nexis GC-2030HC4
# GC-2014HC4

This system is for determining C5 or lower hydrocarbon impurities in LPG. LPG sample is vaporized through liquid sampling valve. Components are separated by alumina PLOT column.

Return to Table

## Analyzer Information

**System Configuration:**
One valve and one SPL injector / one capillary column / one FID

**Sample Information:**
C5 or lower hydrocarbon impurities in LPG

**Methods met:**
UOP-899

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Ethane | 2 ppm | 3,000 ppm |
| 2 | Methane | 2 ppm | 3,000 ppm |
| 3 | Ethylene | 2 ppm | 3,000 ppm |
| 4 | Propane | 2 ppm | 3,000 ppm |
| 5 | Cyclopropane | 2 ppm | 3,000 ppm |
| 6 | Propylene | 2 ppm | 3,000 ppm |
| 7 | Isobutane | 2 ppm | 3,000 ppm |
| 8 | n-Butane | 2 ppm | 3,000 ppm |
| 9 | Propadiene | 2 ppm | 3,000 ppm |
| 10 | Acetylene | 2 ppm | 3,000 ppm |
| 11 | trans-2-Butene | 2 ppm | 3,000 ppm |
| 12 | 1-Butene | 2 ppm | 3,000 ppm |
| 13 | Neopentane | 2 ppm | 3,000 ppm |
| 14 | Isobutylene | 2 ppm | 3,000 ppm |
| 15 | cis-2-Butene | 2 ppm | 3,000 ppm |
| 16 | Isopentane | 2 ppm | 3,000 ppm |
| 17 | n-Pentane | 2 ppm | 3,000 ppm |
| 18 | 1,2-Butadiene | 2 ppm | 3,000 ppm |
| 19 | 1,3-Butadiene | 2 ppm | 3,000 ppm |
| 20 | Propyne | 2 ppm | 3,000 ppm |
| 21 | Vinyl Acetylene | 2 ppm | 3,000 ppm |
| 22 | n-Hexane | 2 ppm | 3,000 ppm |
| 23 | 1-Butyne | 2 ppm | 3,000 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability
- Impurities in hydrogen also can be analyzed

## Typical Chromatograms

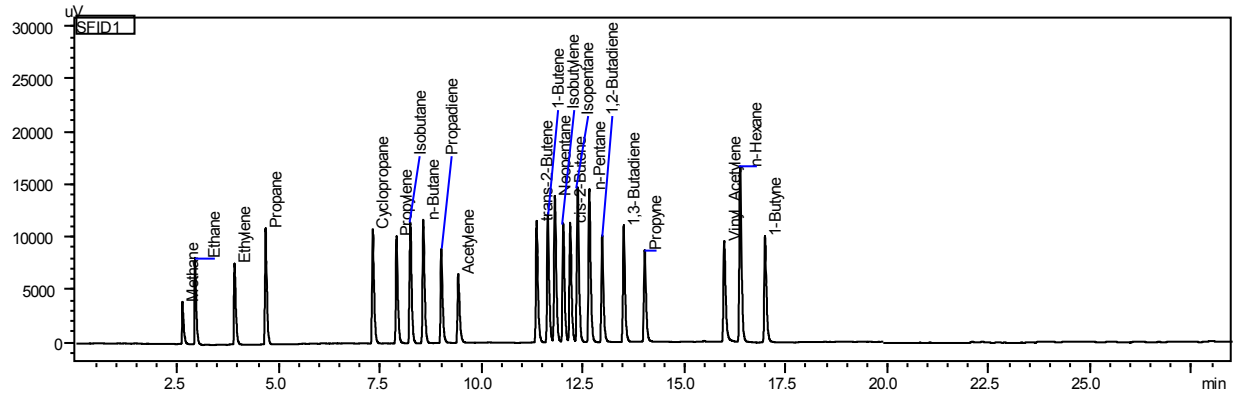


Fig. 1 Chromatogram of FID

Return to Table

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No.49

# System Gas Chromatograph

# Permanent Gas Analysis System
# Nexis GC-2030PGAS1
# GC-2014PGAS1

Return to Table

This method is for determination of the permanent gases in various pure gases. Sample is introduced into two sample loops of two 10-port valves. One sample loop is for determination of He and H2, the other is for determination of Ar, O2and N2. Both 10 ports have Porapak-N backflush columns to remove CO, CO and hydrocarbons. Nitrogen gas is used for He and H2 analysis, and Helium is used for Ar, O2 and N2 analysis. Two molecular sieve capillary columns carry out the separations. The analysis time is approximately 9 minutes. The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Two valves / capillary column with Two TCD detectors

**Sample Information:**
He, $H_2$, Ar, $O_2$, $N_2$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | He | 0.005% | 10% |
| 2 | H2 | 0.005% | 10% |
| 3 | Ar | 0.005% | 10% |
| 4 | O2 | 0.005% | 20% |
| 5 | N2 | 0.005% | 50% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## Typical Chromatograms

- 15 minutes analysis for hydrocarbons analysis can be carried out
- Single FID channel with split/splitless injector
- Liquid sample is measured through internal sample loop in the liquid sampling device

## System Features

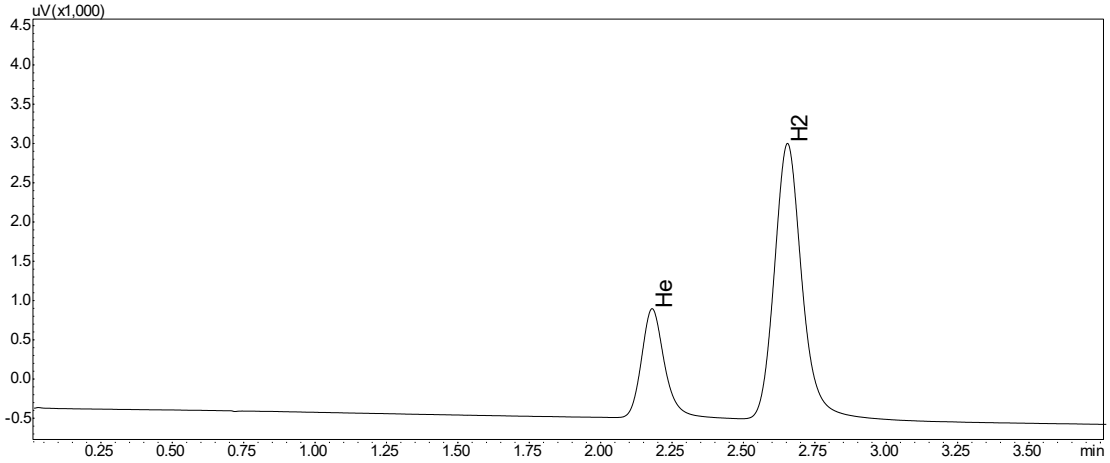


Fig. 1 Chromatogram of TCD

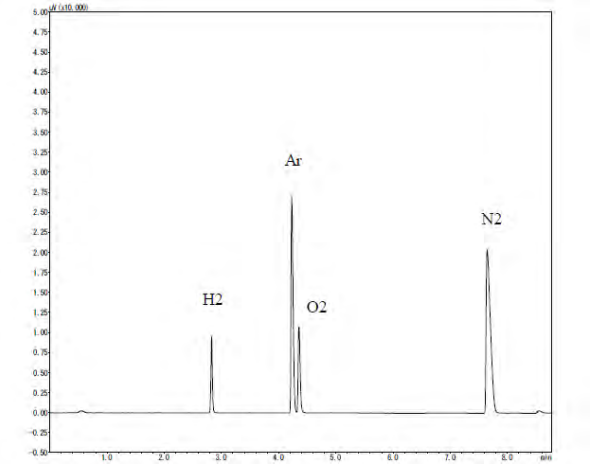


Fig. 2 Chromatogram of TCD

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Table

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No.53

# System Gas Chromatograph

# Permanent Gas with CO/$CO_2$ Gas Analysis System
# Nexis GC-2030PCC1
# GC-2014PCC1

Return to Table

The system enables a quantitative and qualitative analysis of O2, N2, CO and CO2, in municipal gas. A fixed volume of gas sample is introduced into the chromatographic system by sample loop injection and individual components of the sample are identified by the thermal conductivity detector (TCD). Using MS-13X, O2, N2, CH4, CO are separated meanwhile CO2 is separated by P-Q column and detected by TCD. Two automated valves are configured in the system. Lab-Solution chromatography software handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
Two 10-port valves / four packed columns with one TCD detector

**Sample Information:**
$O_2$,$N_2$,CO,$CO_2$,$CH_4$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | O2 | 0.01% | 50% | TCD-1 |
| 2 | N2 | 0.01% | 50% | TCD-1 |
| 3 | CO | 0.01% | 10% | TCD-1 |
| 4 | CH4 | 0.01% | 90% | TCD-1 |
| 5 | CO2 | 0.01% | 10% | TCD-1 |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Versatile software easy GC system operation
- One TCD channel
- Good repeatability

## Typical Chromatograms

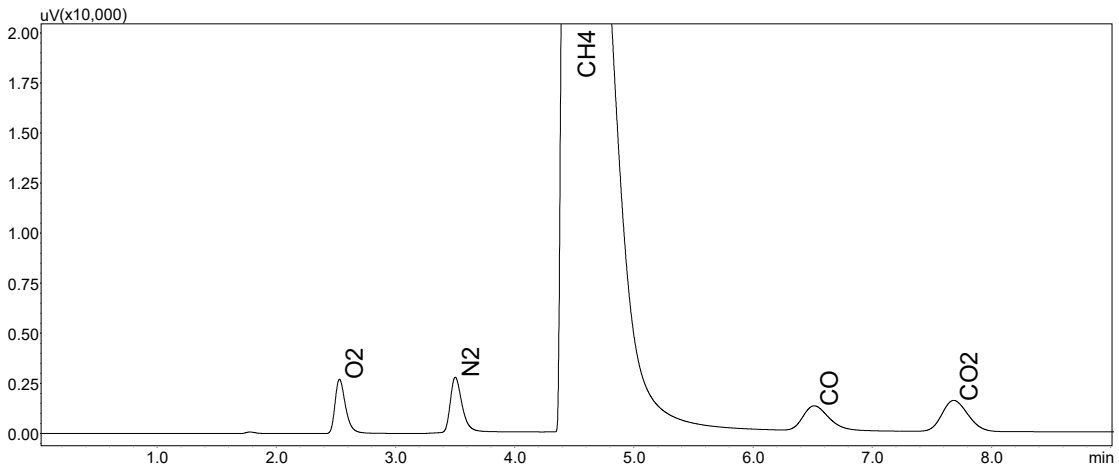


Fig. Chromatogram of TCD

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No.54

# System Gas Chromatograph

# Permanent Gas with $CO/CO_2$ Gas Analysis System
# Nexis GC-2030PCC2
# GC-2014PCC2

Return to Table

The system enables a quantitative and qualitative analysis of O2, N2, CO and CO2, in municipal gas. A fixed volume of gas sample is introduced into the chromatographic system by loop sample injection and individual components of the sample are identified by the thermal conductivity detector (TCD). Using a backflush column, H2O and C3+ are vented out of the system. The valve timing allows the O2, N2, CH4 and CO as a mixed peak to elute to an MS-13X for separation while the CO2 is separated by the P-Q and detected by TCD-2014. Lab Solution chromatography workstation system handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
One 10-port valve and one 6-port valve / four packed columns with one TCD detector

**Sample Information:**
$O_2$,$N_2$,CO,$CO_2$,$CH_4$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | O2 | 0.01% | 50% | TCD-1 |
| 2 | N2 | 0.01% | 50% | TCD-1 |
| 3 | CO | 0.01% | 10% | TCD-1 |
| 4 | CH4 | 0.01% | 90% | TCD-1 |
| 5 | CO2 | 0.01% | 10% | TCD-1 |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Versatile software for operate the system easily
- One TCD channel
- Good repeatability

## Typical Chromatograms

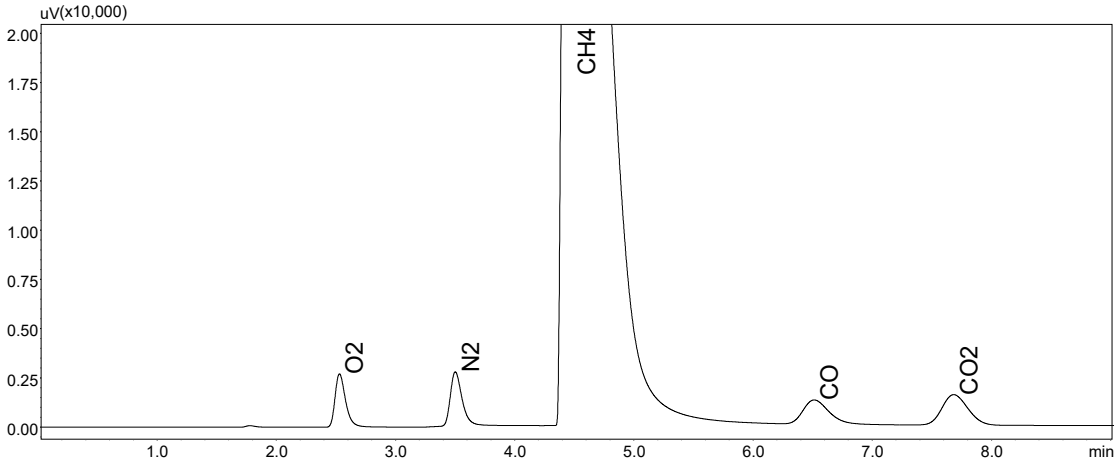


Fig. Chromatogram of TCD

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No.80

## System Gas Chromatograph

# $O_2$ – CO, Ar Analysis System
# Nexis GC-2030PNC
# GC-2014PNC

Return to Table

This instrument is designed for determining the permanent gas and methane within the composition range shown in the specification sheet.
A total of 3 valves and 5 columns are used in this GC system. The sample is loaded into two sample loops for determination. O2 is detected by TCD-1, the valve timing then allows the other components to be separated individually by a Porapak-N and MS-5A column and to be detected by TCD-2. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Three valves / five packed columns with two TCD detectors

**Sample Information:**
$O_2$, $N_2$, Ar, CO, $CH_4$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Ar+O2 | 0.05% | 30% | TCD-2 |
| 2 | N2 | 0.05% | 100% | TCD-2 |
| 3 | CH4 | 0.05% | 90% | TCD-2 |
| 4 | CO | 0.05% | 30% | TCD-2 |
| 5 | O2 | 0.05% | 30% | TCD-1 |
| 6 | Ar | 0.05% | 30% | TCD-2 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One TCD channel or two FID channels
- Good repeatability

## Typical Chromatograms

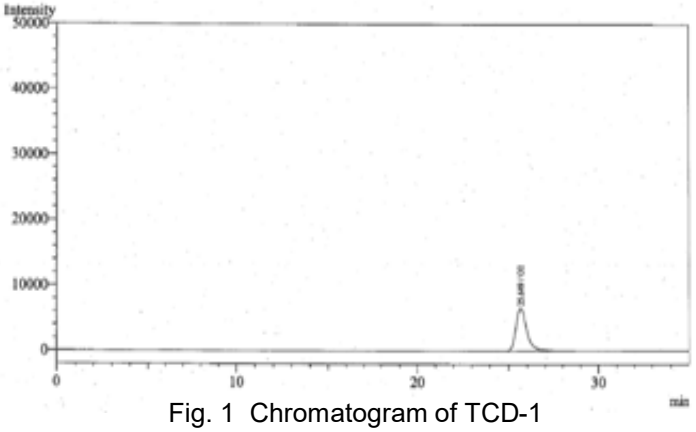


Fig. 1 Chromatogram of TCD-1

Return to Table

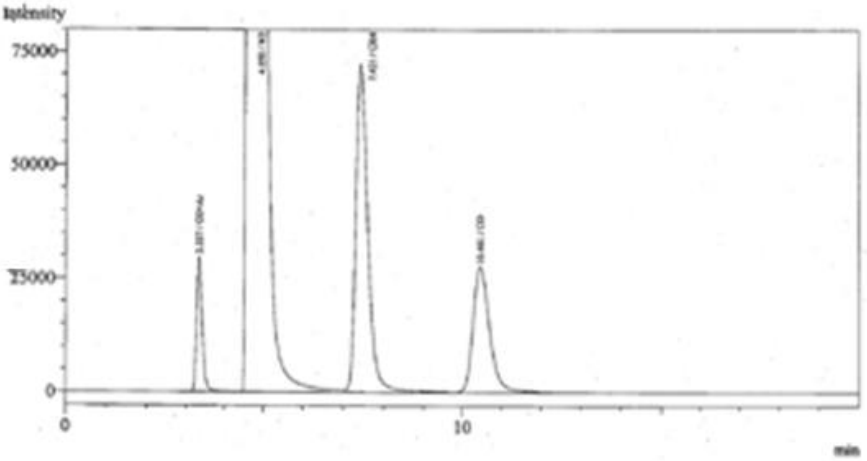


Fig. 2 Chromatogram of TCD-2

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No.17

# System Gas Chromatograph

# High Sensitive CO, $CO_2$, $CH_4$ Analysis Nexis GC-2030CCC1 GC-2014CCC1

Return to Table

This system is designed to measure a trace amount of carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in a gas sample. The sample is injected automatically through a 10-port valve. CO and CO2 are reduced to CH4 by means of a nickel catalyst and detected by a flame ionization detector (FID). If a sample contains a high concentration of CO, CO2 and CH4, a TCD can be used instead of an FID. If the matrix contains O2, the concentration should be less than 0.1%. The system includes LabSolutions GC workstation software.

## Analyzer Information

### System Configuration:

One valve / two packed columns / Methanizer with FID detector

### Sample Information:

CO, $CO_2$, $CH_4$

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CO | 1.0ppm | 100ppm |
| 2 | CO2 | 1.0ppm | 100ppm |
| 3 | CH4 | 1.0ppm | 100ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single channel with packed columns
- Hydrocarbons are backflushed by the pre-column while trace CO, $CO_2$, and $CH_4$ pass through a methanizer and detected with FID
- 6 minutes analysis time

## Typical Chromatograms

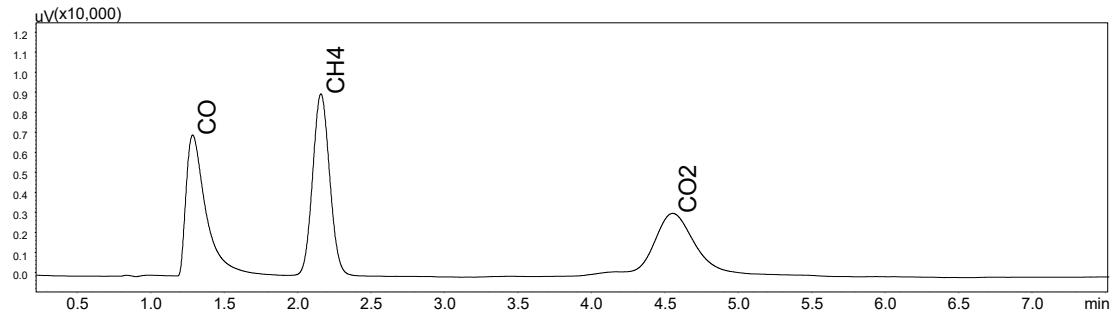


Fig. 1 Chromatogram of FID

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No.18

# System Gas Chromatograph

# CO, CO2, CH4 Analysis
# Nexis GC-2030CCC2
# GC-2014CCC2

Return to Table

This system is designed to measure carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in a gas sample. The sample is injected automatically through a 10-port valve. The target CO, CO2 and CH4 are treated by a pre-column and then separation occurs in a charcoal column. Since the target concentrations are high, a TCD is used. If the matrix gas contains H2, N2, O2 and Ar, the concentrations should be less than 0.1%. The system includes LabSolutions GC workstation software.

## Analyzer Information

### System Configuration:
One valve / two packed columns with TCD detector

### Sample Information:
CO, $CO_2$, $CH_4$

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CO | 0.01% | 20% |
| 2 | CO2 | 0.01% | 20% |
| 3 | CH4 | 0.01% | 20% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single channel with packed columns
- Hydrocarbons and water are backflushed by the pre-column while trace CO, $CO_2$, $CH_4$ reach TCD
- 4 minutes analysis time

## Typical Chromatograms

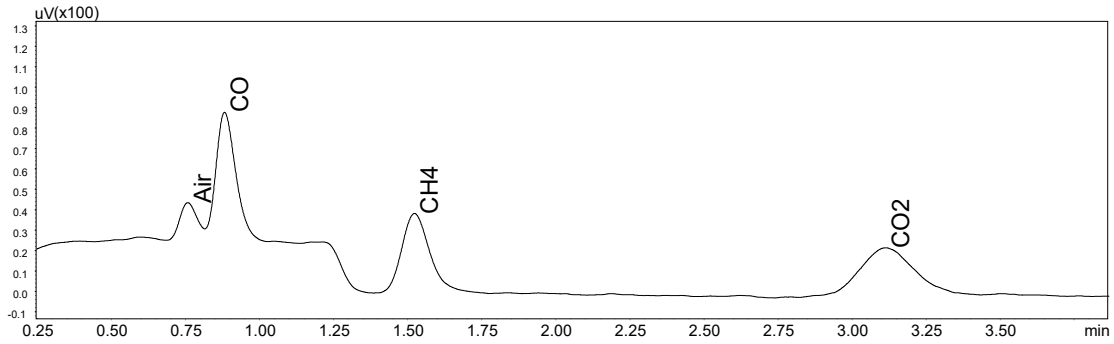


Fig. 1 Chromatogram of TCD

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No.19

# System Gas Chromatograph

# CO, $CO_2$, $CH_4$ Analysis
# Nexis GC-2030CCC3
# GC-2014CCC3

Return to Table

This system is designed to measure a trace amount of carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in a gas sample. The sample is injected automatically through a 10-port valve. The target CO, CO2 and CH4 are treated by a pre-column and then separation occurs using a charcoal column. A methanizer is used for high-sensitivity detection of trace concentrations. In contrast, if the target concentrations are high, a TCD can be used. This system allows selection of the detector according to the concentration of the target components. Why is this statement here? When using an FID, the concentration of O2 should be less than 0.1%, if the matrix contains O2. If using a TCD, the concentration of H2, N2, O2 and Ar should be less than 0.1% if the matrix contains these gases. The system includes LabSolutions GC workstation software.

## Analyzer Information

### System Configuration:

Two valves / two packed columns / Methanizer with FID and TCD detector

### Sample Information:

CO, $CO_2$, $CH_4$

### Concentration Range:

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CO | 1.0ppm | 100ppm |
| 2 | CO2 | 1.0ppm | 100ppm |
| 3 | CH4 | 1.0ppm | 100ppm |
| 4 | CO | 0.01% | 20% |
| 5 | CO2 | 0.01% | 20% |
| 6 | CH4 | 0.01% | 20% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Dual channel with packed columns
- Hydrocarbons and water are backflushed by the pre-column while high concentration CO, $CO_2$, and $CH_4$ reach TCD
- Hydrocarbons are back flush by the pre-column while trace CO, $CO_2$, $CH_4$ pass through to a methanizer and detection with FID
- 6 minutes analysis time

## Typical Chromatograms

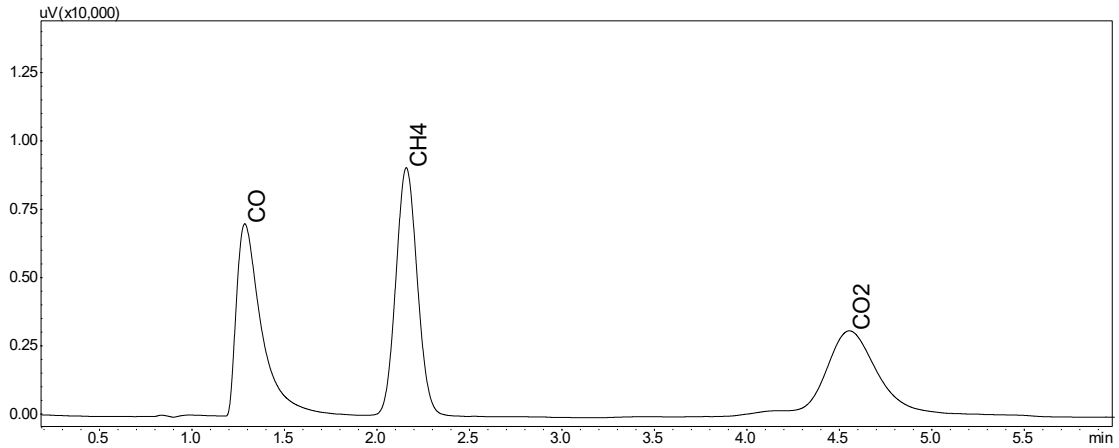


Fig. 1 Chromatogram of FID-1

## Typical Chromatograms

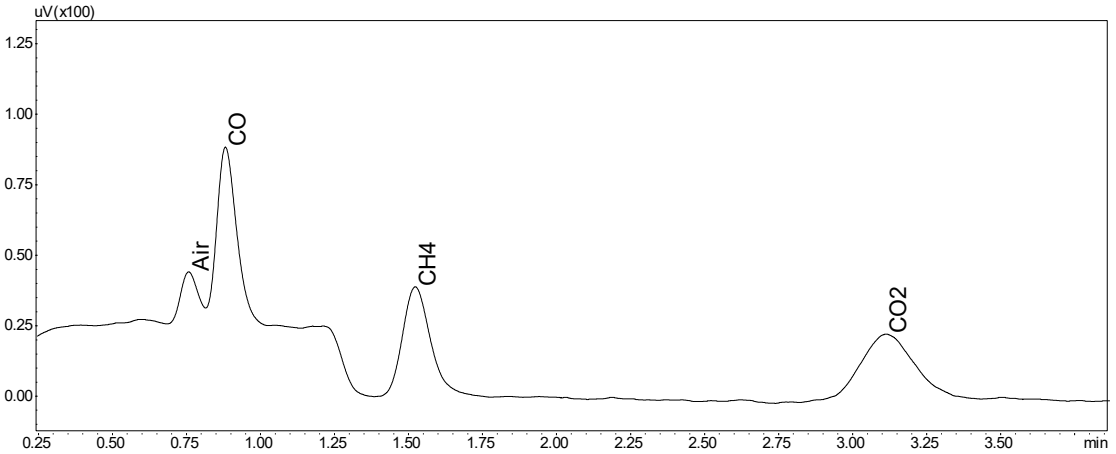


Fig. 1 Chromatogram of TCD-1

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No.20

System Gas Chromatograph

# High Sensitive CO, $CO_2$, $CH_4$ Analysis
# Nexis GC-2030CCC4
# GC-2014CCC4

Return to Table

This system is designed to measure a trace amount of carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in a gas sample, such as He, H2, N2 and Ar. The sample is injected automatically through a 10-port valve. First, a Porapak-N pre-column is used to cut the above C2 compounds. The Porapak functions to separate CO/CH4 and CO2. CO and CH4 are separated by an MS-13X column, while CO2 moves through the Porapak-Q. CO/CH4 and CO2 are then combined before a methanizer. CO and CO2 are reduced to CH4 by means of a nickel catalyst and detected by a flame ionization detector (FID). If the matrix contains O2, this concentration should be less than 0.1% to protect the catalyst from damage The system includes LabSolutions GC workstation software.

## Analyzer Information

**System Configuration:**
Two valves / four packed columns / Methanizer with FID detector

**Sample Information:**
CO, $CO_2$, $CH_4$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CO | 1.0ppm | 100ppm |
| 2 | CO2 | 1.0ppm | 100ppm |
| 3 | CH4 | 1.0ppm | 100ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single channel with packed columns
- Hydrocarbons and water are backflushed by the pre-column while trace CO, $CO_2$, $CH_4$ reach FID.
- Good separation between $CH_4$ and CO with MS-13X packed column
- 13 minutes analysis time

## Typical Chromatograms

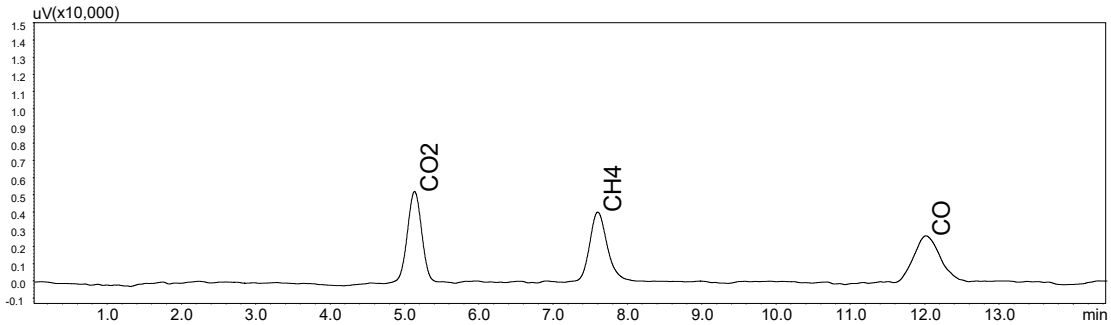


Fig. 1 Chromatogram of FID

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No.21

# System Gas Chromatograph

# High Sensitive CO, $CO_2$, $CH_4$ Analysis
# Nexis GC-2030CCC5
# GC-2014CCC5

Return to Table

This system is designed to measure a trace amount of carbon monoxide (CO), methane (CH4) and carbon dioxide (CO2) in an O2 gas sample. The sample is injected automatically through a 10-port valve. First, a Porapak-N pre-column is used to cut the C2 compounds. Second, Porapak functions to separate CO/CH4 and CO2. CO and CH4 are separated by an MS-13X column. Since a large amount of O2 gas affects the lifetime of a methanizer catalyst, the O2 gas needs to be removed using an additional 6-port valve. Conversely, CO2 moves through the Porapak-Q. CO/CH4 and CO2 pass through the methanizer device and converted to methane for detection by FID. The system includes Lab Solutions GC workstation software.

## Analyzer Information

**System Configuration:**
Three valves / four packed columns / Methanizer with FID detector

**Sample Information:**
CO, $CO_2$, $CH_4$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | CO | 1.0ppm | 100ppm |
| 2 | CO2 | 1.0ppm | 100ppm |
| 3 | CH4 | 1.0ppm | 100ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single channel with packed columns
- Matrix $O_2$ are removed by the third valve by using cutting technology
- Hydrocarbons and water are backflushed by the pre-column while trace CO, $CO_2$, and $CH_4$ reach FID
- Good separate $CH_4$ and CO with MS-13X packed column
- 13 minutes analysis time

## Typical Chromatograms

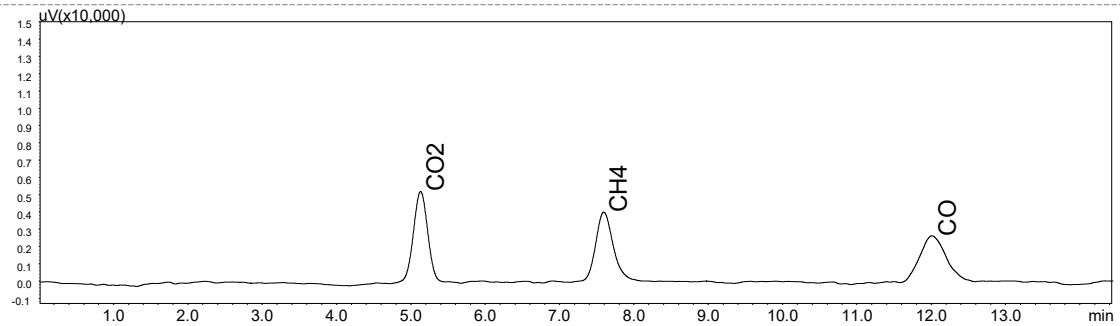


Fig. 1 Chromatogram of FID

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No.178

# System Gas Chromatograph

## Trace CO and CO2 in Hydrogen/ Light Gaseous Hydrocarbons
## Nexis GC-2030CCC6
## GC-2014CCC6

Return to Table

This method is for determining the composition of trace carbon monoxide and carbon dioxide and methane in methane and hydrogen and vaporized liquefied petroleum gas (LPG) as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic sampling and column switching technique in multiple columns.

### Analyzer Information

**System Configuration:**
Two valves/ two packed columns / one FID detector

**Sample Information:**
Determining the composition of carbon monoxide and carbon dioxide and methane in propylene and hydrogen and vaporized liquefied petroleum gas (LPG)

**Methods met:**
UOP-603

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Carbon Monoxide | 0.1 ppm | 500 ppm |
| 2 | Carbon Dioxide | 0.2 ppm | 500 ppm |
| 3 | Methane | 0.2 ppm | 500 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Vaporizer is also available for LPG analysis(Optional)
- Back flushing technique for long-term stability of system

### Typical Chromatograms

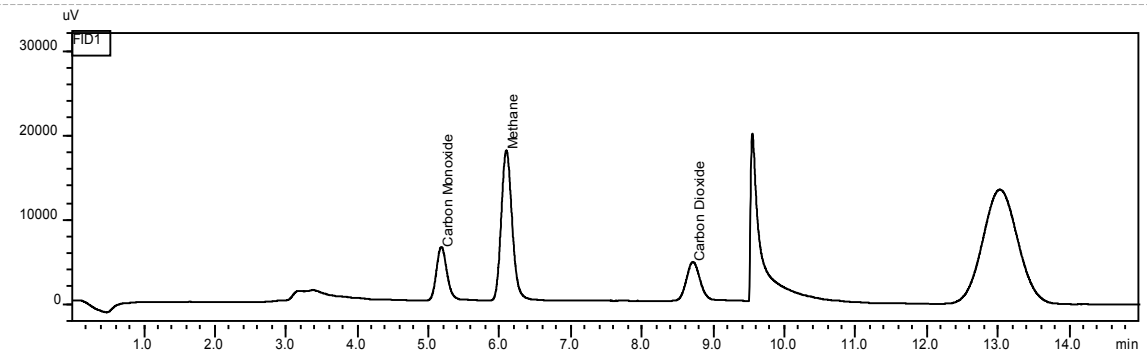


Fig. 1 Chromatogram of FID

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No.108

# System Gas Chromatograph

## Methanol, Methylformate, and Acetoaldehyde in Propylene Oxide
## Nexis GC-2030ALC
## GC-2014ALC

Return to Table

This GC is designed to measure methanol, methylformate, and acetoaldehyde in propylene oxide by gas chromatography (GC) FID. A liquid sample is injected by the AOC-20i to start the analysis. The sample is separated by a Gaskuropack 56 column. LabSolutions software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
Two packed columns with two FID detectors

**Sample Information:**
Methanol, Methylformate, Acetoaldehyde

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Methanol | 10ppm | 100ppm | FID |
| 2 | Methylformate | 10ppm | 100ppm | FID |
| 3 | Acetoaldehyde | 10ppm | 100ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 8 minutes analysis for all composition analysis can be carried out
- One FID channel
- Good repeatability

### Typical Chromatograms

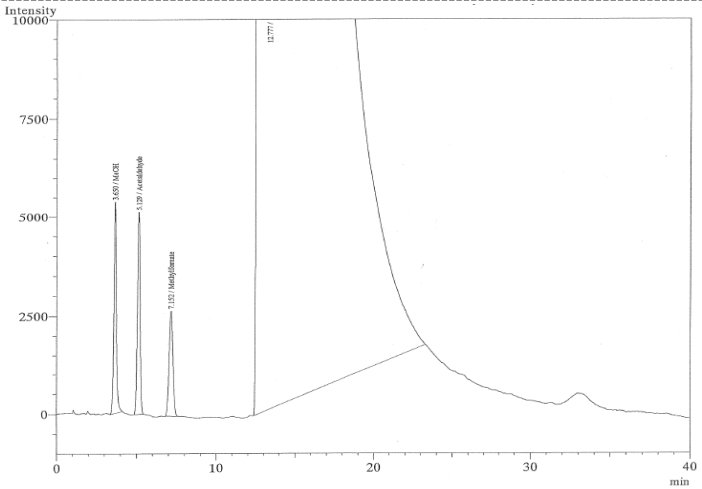


Fig. Chromatogram of FID

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No.104

# System Gas Chromatograph

## Formaldehyde in Propylene Oxide Analysis System

## Nexis GC-2030FOR
## GC-2014FOR

Return to Table

This GC is designed to measure formaldehyde in propylene oxide within the composition range shown in the specification sheet. Two FIDs are used in this GC system. The liquid sample is injection by AOC-20i to start the analysis. The sample is separated by a Porapak-T column and detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
Two packed columns with two FID detectors

**Sample Information:**
HCHO

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | HCHO | 10ppm | 50ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- Two FID channels
- Good repeatability

### Typical Chromatograms

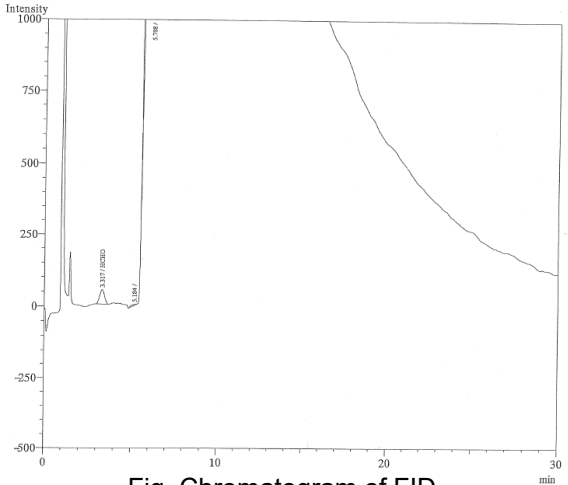


Fig. Chromatogram of FID

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No.105

# System Gas Chromatograph

## Glycol, Cumene, Benzene in Propylene Oxide Analysis System

## Nexis GC-2030GCB
## GC-2014GCB

Return to Table

This GC is designed to measure glycol, cumene, benzene in propylene oxide within the composition range shown in the specification sheet. The liquid sample is injection by AOC-20i to start the analysis. The sample is separated by a DB-WAX column and detected by FID. The system includes LabSolutions workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FID detector

**Sample Information:**
Cumene, Ethylbenzene, Acetophenone, Phenol, Methylbenzilalchol, Methylstyrene, Cumyl alcohol, Propylene glycol, Dipropylene glycol Tripropylene glycol

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Cumene | 5ppm | 500ppm | FID |
| 2 | Ethylbenzene | 5ppm | 500ppm | FID |
| 3 | Acetophenone | 5ppm | 500ppm | FID |
| 4 | Phenol | 5ppm | 500ppm | FID |
| 5 | Methylbenzilalchol | 5ppm | 500ppm | FID |
| 6 | Methylstyrene | 5ppm | 500ppm | FID |
| 7 | Cumyl alcohol | 5ppm | 500ppm | FID |
| 8 | Propylene glycol | 5ppm | 500ppm | FID |
| 9 | Dipropylene glycol | 5ppm | 500ppm | FID |
| 10 | Tripropylene glycol | 5ppm | 500ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 36 minutes analysis for all composition analysis can be carried out
- One FID channel
- Good repeatability

## Typical Chromatograms

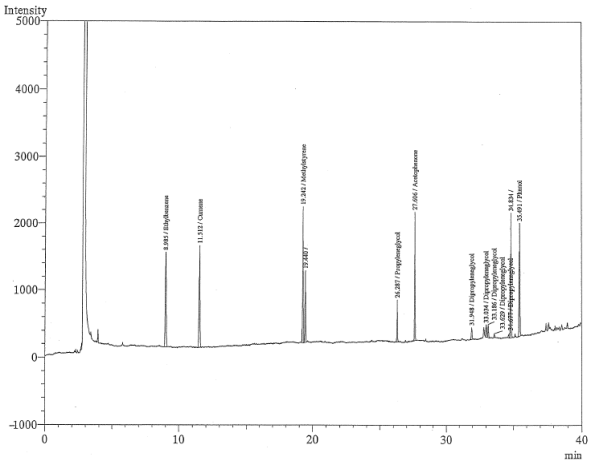


Fig. Chromatogram of FID

Return to Table

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No.185

System Gas Chromatograph

# Hydrocarbons in Sulfolane Analysis
# Nexis GC-2030IMP
# GC-2014IMP

Return to Table

This method is for determining hydrocarbons in Sulfolane or similar composites as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
Determining low concentrations of hydrocarbons in lean solvent sulfolane.benzene,toluene,C8 aromatics composites, and C9 aromatics composites are determined.

**Methods met:**
UOP-831

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Benzene | 1.0 ppm | 100 ppm |
| 2 | Toluene | 1.0 ppm | 100 ppm |
| 3 | C8 Aromatics | 1.0 ppm | 100 ppm |
| 4 | C9+ | 1.0 ppm | 100 ppm |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

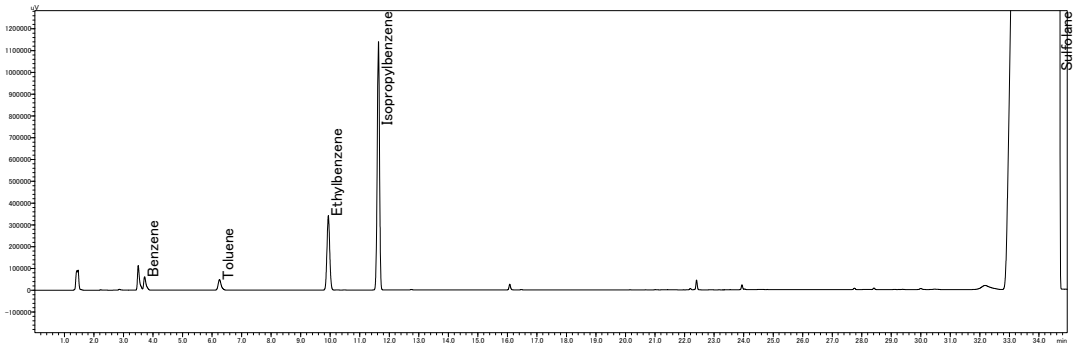


Fig. 1 Chromatogram of FID

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No.113

# System Gas Chromatograph

## Volatile Organic Compounds in Atmospheric Air Analysis System

## Nexis GC-2030VOC
## GC-2014VOC

Return to Table

This GC is designed to measure volatile organic compounds in atmospheric air. One valve and one column is used to create this GC system. The sample is separated by a DB-1 column and is detected by FID. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

### Analyzer Information

**System Configuration:**
One valve / one capillary column with one FID detector

**Sample Information:**
Vinylchloride, 1,2-Dichloroethane, Benzene, Ethylene oxide

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | Vinylchloride | 5ppm | 100ppm | FID |
| 2 | 1,2-Dichloroethane | 5ppm | 100ppm | FID |
| 3 | Benzene | 5ppm | 100ppm | FID |
| 4 | Ethylene oxide | 5ppm | 100ppm | FID |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- 11 minutes analysis for all composition analysis can be carried out
- One FID channel
- Good repeatability

### Typical Chromatograms

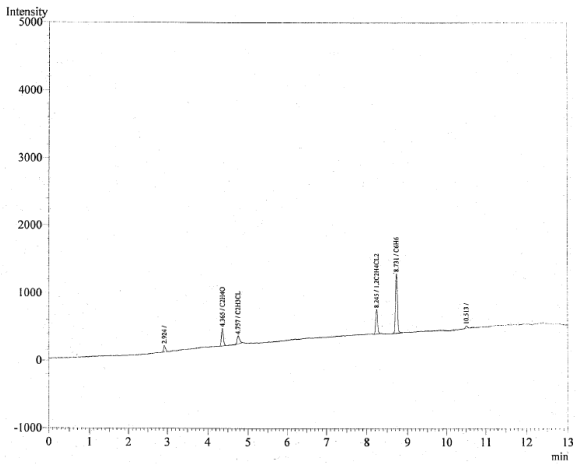


Fig. Chromatogram of FID

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No.101

# System Gas Chromatograph

## Volatile Organic Phosphorus Compounds Analysis System
## Nexis GC-2030VOP
## GC-2014VOP

Return to Table

This GC is designed for determining volatile organic phosphorus compounds within the composition range shown in the specification sheet. The sample is directly injected by AOC-20i, and separation is performed by a CP-WAX 52CB column and detected by FPD. The system includes LabSolution workstation software and BTU and Specific Gravity calculation software.

### Analyzer Information

**System Configuration:**
One SPL / one capillary column with one FPD detector

**Sample Information:**
TBP,TEPO,M-DBPO,TBPO

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | TBP | 1ppm | 100ppm | FPD |
| 2 | TEPO | 1ppm | 100ppm | FPD |
| 3 | M-DBPO | 1ppm | 100ppm | FPD |
| 4 | TBPO | 1ppm | 100ppm | FPD |

Detection limits may vary depending on the sample. Please contact us for more consultation.

### System Features

- Versatile software easy GC system operation
- One FPD channel
- Good repeatability

### Typical Chromatograms

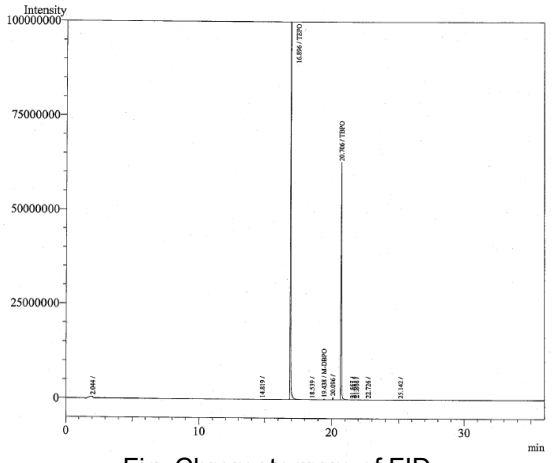


Fig. Chromatogram of FID

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No.84

# System Gas Chromatograph

# H2O in Gas Sample Analysis System
# Nexis GC-2030H2O
# GC-2014H2O

Return to Table

This instrument is designed for the determination of H2O by gas chromatography (GC) and detection by TCD. A Porapak-Q pre-column is used, Porapak-Q and Sunpak S are used to separate the water from the matrix. LabSolutions chromatography software handles all aspects of GC control, automation, and data handling.

## Analyzer Information

**System Configuration:**
Two valves / two packed columns with one TCD detector

**Sample Information:**
$H_2O$

**Concentration Range:**

| No. | Name of Compound | Concentration Range | | Detector |
|---|---|---|---|---|
| | | Low Conc. | High Conc. | |
| 1 | H2O | 0.05% | 50.00% | TCD-1 |

Detection limits may vary depending on the sample. Please contact us for more consultation.

## System Features

- 7 minutes analysis for H2O analysis can be carried out
- One TCD channel
- Good repeatability

## Typical Chromatograms

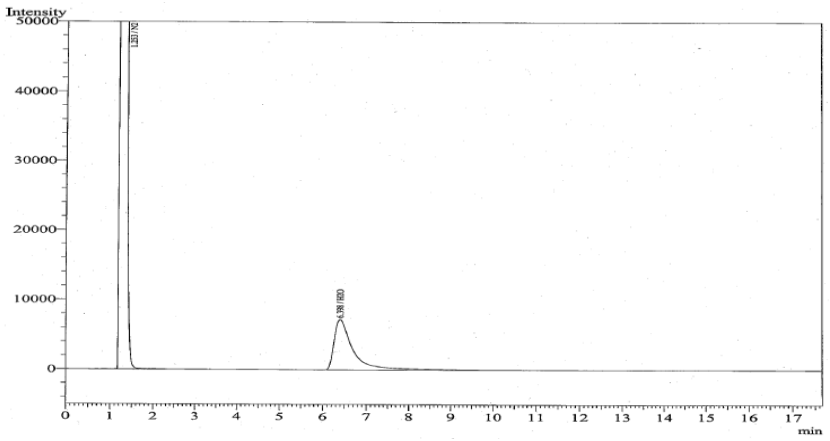


Fig. Chromatogram of TCD

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No.170

System Gas Chromatograph

# Impurities in p-Xylene Analysis
# Nexis GC-2030PXY1
# GC-2014PXY1

Return to Table

This method is for determining trace impurities in xylene as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

## Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID

**Sample Information:**
Determining impurities in p-xylene

**Methods met:**
ASTM-D3798

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non aromatics | 10 ppmwt | 10,000 ppmwt |
| 2 | Toluene | 10 ppmwt | 10,000 ppmwt |
| 3 | Ethylbenzene | 10 ppmwt | 10,000 ppmwt |
| 4 | p-Xylene | 99 %wt | 100 %wt |
| 5 | m-Xylene | 10 ppmwt | 10,000 ppmwt |
| 6 | Benzene | 10 ppmwt | 10,000 ppmwt |
| 7 | Isopropylbenzene | 10 ppmwt | 10,000 ppmwt |
| 8 | o-Xylene | 10 ppmwt | 10,000 ppmwt |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

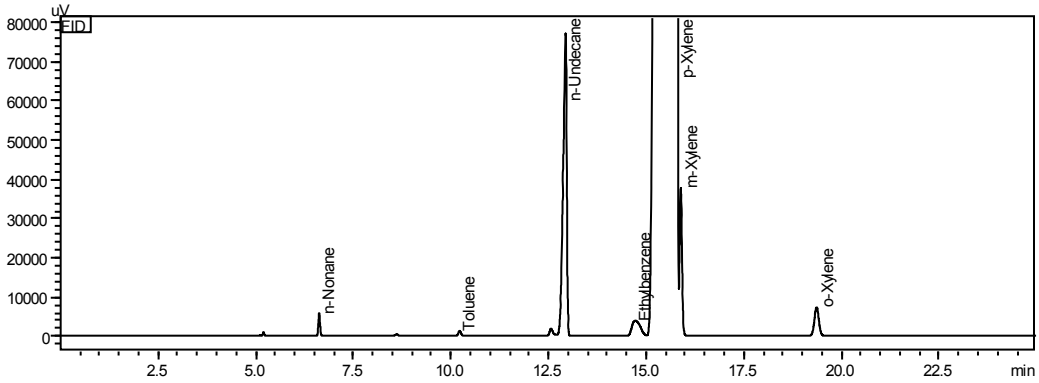


Fig. 1 Chromatogram of FID

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No.181

## System Gas Chromatograph

# Impurities in p-Xylene Analysis
# Nexis GC-2030PXY2
# GC-2014PXY2

Return to Table

This system is for determining the impurities in p-xylene as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID detector

**Sample Information:**
Trace hydrocarbon impurities in high purity p-xylene

**Methods met:**
UOP-720

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non-aromatics | 0.002% | 2.000% |
| 2 | Benzene | 0.002% | 2.000% |
| 3 | Toluene | 0.002% | 2.000% |
| 4 | Ethylbenzene | 0.002% | 2.000% |
| 5 | m-Xylene | 0.002% | 2.000% |
| 6 | o-Xylene | 0.002% | 2.000% |
| 7 | C9+ Aromatics | 0.002% | 2.000% |
| 8 | 1,4-Diethylbenzene | 0.002% | 2.000% |
| 9 | p-Xylene | 98.000% | 100.000% |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

### System Features

- Single FID channel
- Good repeatability

### Typical Chromatograms

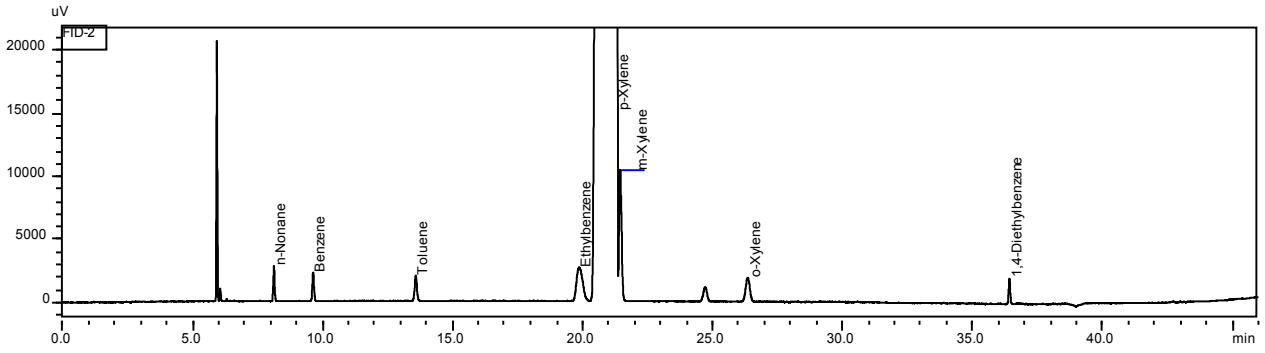


Fig. 1 Chromatogram of FID

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No.187

## System Gas Chromatograph

# Trace Impurities in Xylenes
# Nexis GC-2030HC5
# GC-2014HC5

Return to Table

This method is for determining the trace impurities in Xylenes as described in below compound table. It requires the use of a dedicated gas chromatographic system which is configured with an automatic liquid injector.

### Analyzer Information

**System Configuration:**
One SPL injector / one capillary column / one FID

**Methods met:**
UOP-931

**Sample Information:**
Specific trace impurities determined include non-aromatic hydrocarbons, benzene, toluene and individual C9 and C10 aromatic compounds.

**Concentration Range:**

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 1 | Non-aromatics | 1 ppmwt | 500 ppmwt |
| 2 | Benzene | 1 ppmwt | 500 ppmwt |
| 3 | Toluene | 1 ppmwt | 500 ppmwt |
| 4 | n-Undecane | 1 ppmwt | 500 ppmwt |
| 5 | Ethylbenzene | 1 ppmwt | 500 ppmwt |
| 6 | p-Xylene | 1 ppmwt | 500 ppmwt |
| 7 | m-Xylene | 1 ppmwt | 500 ppmwt |
| 8 | Isopropylbenzene | 1 ppmwt | 500 ppmwt |
| 9 | o-Xylene | 1 ppmwt | 500 ppmwt |
| 10 | n-Propylbenzene | 1 ppmwt | 500 ppmwt |
| 11 | 1-Methyl-4-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 12 | 1-Methyl-3-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 13 | 1,3,5-Trimethylbenzene | 1 ppmwt | 500 ppmwt |
| 14 | sec-Butylbenzene | 1 ppmwt | 500 ppmwt |
| 15 | tert-Butylbenzene | 1 ppmwt | 500 ppmwt |
| 16 | 1-Methyl-3-isopropylbenzene | 1 ppmwt | 500 ppmwt |
| 17 | 1-Methyl-4-isopropylbenzene | 1 ppmwt | 500 ppmwt |
| 18 | Styrene | 1 ppmwt | 500 ppmwt |
| 19 | 1-Methyl-2-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 20 | 1,2,4-Trimethylbenzene | 1 ppmwt | 500 ppmwt |

| No. | Name of Compound | Concentration Range | |
|---|---|---|---|
| | | Low Conc. | High Conc. |
| 21 | 1-Methyl-2-isopropylbenzene | 1 ppmwt | 500 ppmwt |
| 22 | 1-Methyl-3-n-propylbenzene | 1 ppmwt | 500 ppmwt |
| 23 | 1,4-Diethylbenzene | 1 ppmwt | 500 ppmwt |
| 24 | 1,3-Dimethyl-5-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 25 | 1,2-Diethylbenzene | 1 ppmwt | 500 ppmwt |
| 26 | 1,2,3-Trimethylbenzene | 1 ppmwt | 500 ppmwt |
| 27 | 1,4-Dimethyl-2-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 28 | 1,3-Dimethyl-4-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 29 | 1,2-Dimethyl-4-ethylbenzene | 1 ppmwt | 500 ppmwt |
| 30 | Indane | 1 ppmwt | 500 ppmwt |
| 31 | 1-Methyl 4 n-Propyl Benzene | 1 ppmwt | 500 ppmwt |
| 32 | Isobutyl Benzene | 1 ppmwt | 500 ppmwt |
| 33 | Heavy aromatics | 1 ppmwt | 500 ppmwt |

Detection limits may vary depending on the sample.
Please contact us for more consultation.

## System Features

- Single FID channel
- Good repeatability

## Typical Chromatograms

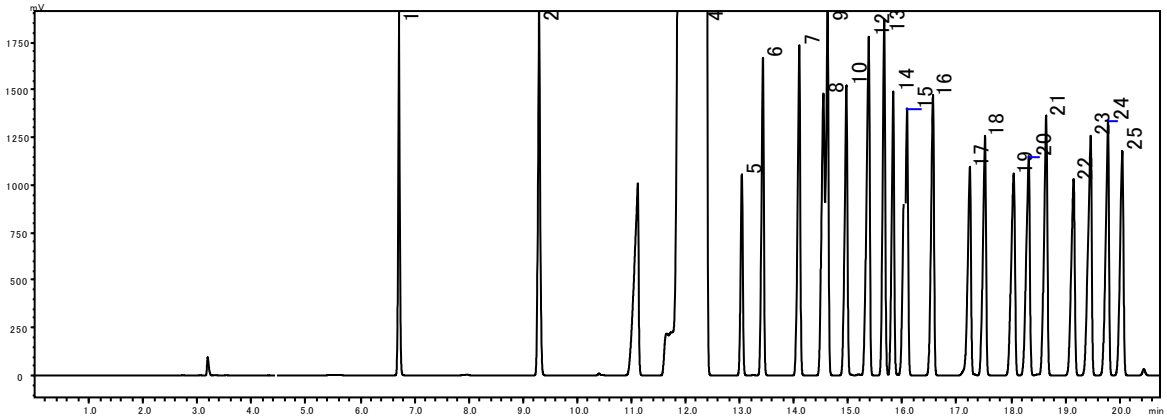


Fig. 1 Chromatogram of FID

| | | | |
|---|---|---|---|
| 1 | Benzene | 14 | 1-Methyl-2-ethylbenzene |
| 2 | Toluene | 15 | 1-Methyl-4-isopropylbenzene |
| 3 | n-Undecane | 16 | 1,2,4-Trimethylbenzene |
| 4 | p-Xylene + m-Xylene + Ethylbenzene | 17 | 1-Methyl-3-n-propylbenzene |
| 5 | Isopropylbenzene | 18 | 1,4-Diethylbenzene |
| 6 | o-Xylene | 19 | 1,3-Dimethyl-5-ethylbenzene |
| 7 | n-Propylbenzene | 20 | 1,2-Diethylbenzene |
| 8 | 1-Methyl-4-ethylbenzene | 21 | 1,2,3-Trimethylbenzene |
| 9 | 1-Methyl-3-ethylbenzene | 22 | 1,4-Dimethyl-2-ethylbenzene |
| 10 | tert-Butylbenzene | 23 | 1,3-Dimethyl-4-ethylbenzene |
| 11 | 1,3,5-Trimethylbenzene | 24 | 1,2-Dimethyl-4-ethylbenzene |
| 12 | sec-Butylbenzene | 25 | Indane |
| 13 | Styrene | | |

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