

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

H₂, He, O₂, N₂, CO, CO₂, H₂S, C1 to C18, etc.

▶ Ultra-fast Refinery Gas Analysis

H₂, O₂, N₂, H₂S, CO, CO₂, C1-C5, C6-C13, etc.

▶ Natural Gas Analysis

H₂, O₂, N₂, H₂S, CO, CO₂, 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

H₂, O₂, N₂, CH₄, CO, CO₂, C₂

▶ Town Gas Analysis

H₂, O₂, N₂, CO, CO₂, C1, C2, C3

▶ Trace Sulfur Analysis

H₂S, COS, SO₂, mercaptans, aromatic sulfur compounds and sulfides, thiophene in benzene

▶ Green House Gas Analysis

N₂O, O₂, N₂, CO, CO₂, CH₄

▶ Downstream and Others

Refinery Gas Solution

Gas compositions produced in refinery plants consist of hydrocarbons, permanent gases, H₂S, 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 ₂ H ₄ , C ₂ H ₆ , C ₂ H 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 ₂ S, CO, CO ₂ , C1-C5, C6+ (backflush)	TCDx2, FID	10 minutes	No. 7
ASTM-D1945, D1946, D3588, GPA-2261	O ₂ , N ₂ , H ₂ S, 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 ₂ S, CO, CO ₂ , C1-C5, C6+ (backflush)	TCDx2, FID	10 minutes	No. 120
ASTM-D1945, D1946, D3588, GPA-2261	O ₂ , N ₂ , H ₂ S, 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 ₂ S, CO, CO ₂ , C1-C5, C6+ (backflush)	TCDx2, FID	6 minutes	No. 43
ASTM-D1945, D1946, D3588, GPA-2261	O ₂ , N ₂ , H ₂ S, 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 ₂ S, C1 to C18	TCDx2, FIDx2	25 minutes	No. 45
ASTM-D1945, D1946, D3588, GPA-2261	O ₂ , N ₂ , CO, CO ₂ , H ₂ S, C1 to C18	TCD, FIDx2	25 minutes	No. 46

Application
Data Sheet

No. 63

System Gas Chromatograph

**Trace H₂ Analysis System
Nexis GC-2030TH2
GC-2014TH2**



Return to
Table

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:

H₂

Methods met:

ASTM-D2504

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂	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

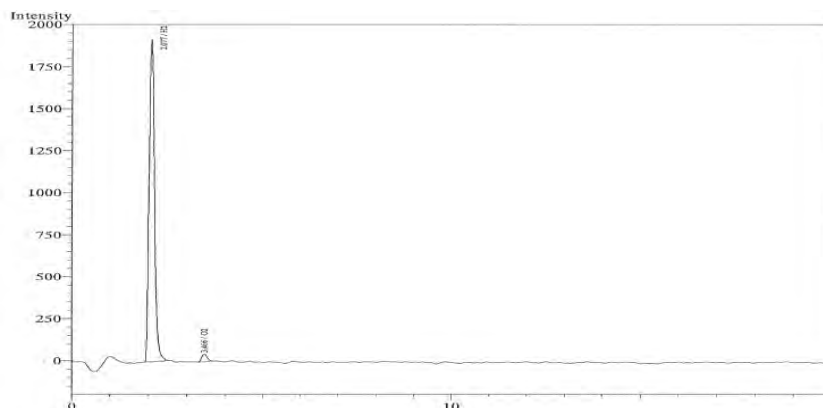


Fig. Chromatogram of TCD

First Edition: November, 2017

Application
Data Sheet

No.64

System Gas Chromatograph

Trace O₂ and N₂ Analysis System
Nexis GC-2030TNO
GC-2014TNO



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:

O₂, N₂

Methods met:

ASTM-D2504

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	O ₂	5ppm	500ppm	TCD-1
2	N ₂	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

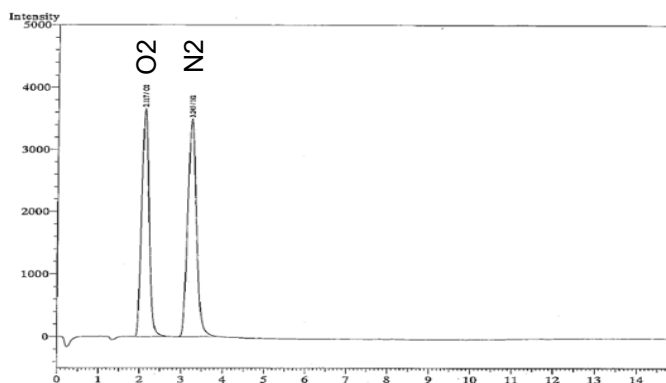


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No.65

System Gas Chromatograph

Trace CO and CO₂ Analysis System Nexis GC-2030TCC GC-2014TCC



Return to Table

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, CO₂, CH₄

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	CO ₂	0.5ppm	100ppm	FID+MTN
3	CH ₄	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

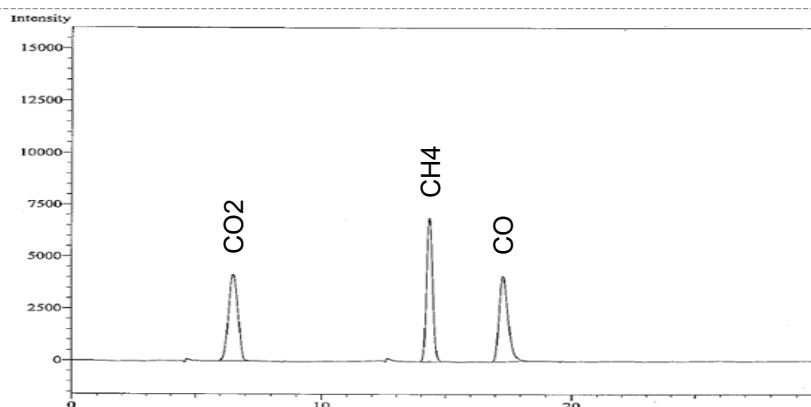


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 66

System Gas Chromatograph

Composition of H₂ – C₂H₂ Analysis Nexis GC-2030HC2 GC-2014HC2

Return to
Table

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:

H₂, O₂, N₂, Ar, CO, CO₂, C₂H₄, C₂H₆, C₂H₂

Methods met:

ASTM-D1945

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂	0.05%	100%	TCD-1
2	Ar+O ₂	0.05%	30%	TCD-2
3	N ₂	0.05%	100%	TCD-2
4	CH ₄	0.05%	90%	TCD-2
5	CO	0.05%	50%	TCD-2
6	CO ₂	0.05%	60%	TCD-2
7	C ₂ H ₆	0.05%	50%	TCD-2
8	C ₂ H ₄	0.05%	50%	TCD-2
9	C ₂ H ₂	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

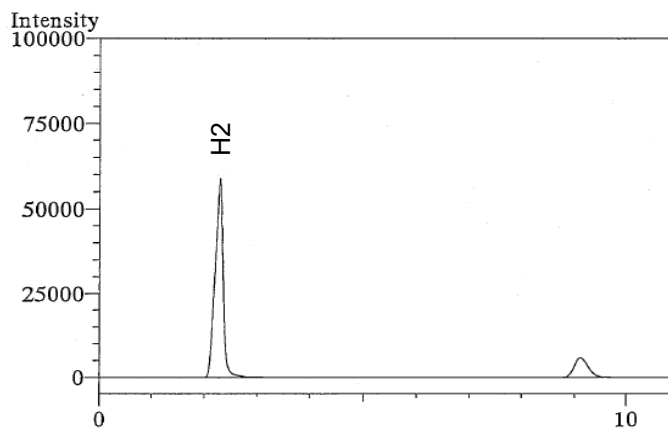


Fig. 1 Chromatogram of TCD-1

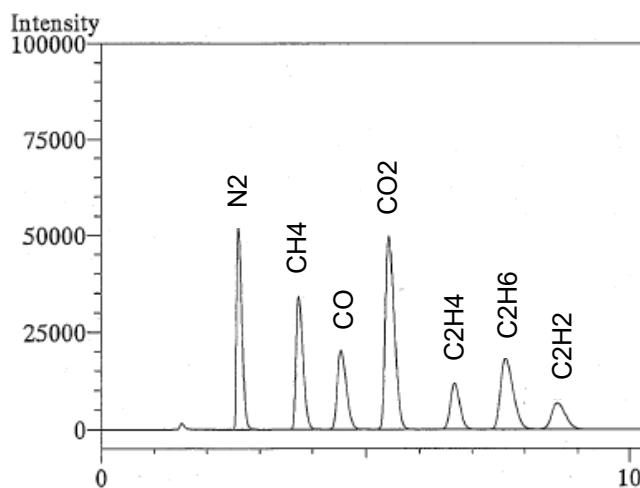


Fig. 2 Chromatogram of TCD-2



Return to Table

Application Data Sheet

No.67

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 C3 through to C5 to 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 N₂ as 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:

H₂, O₂, N₂, Ar, CO, CO₂, C₁-C₅, C₆₊

Methods met:

ASTM-D2163

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂	0.05%	100%	TCD-2
2	Ar+O ₂	0.05%	100%	TCD-1
3	N ₂	0.05%	100%	TCD-1
4	CH ₄	0.05%	50%	TCD-1
5	CO	0.05%	20%	TCD-1
6	CO ₂	0.05%	60%	TCD-1
7	C ₂ H ₆	0.05%	15%	TCD-1
8	C ₂ H ₄	0.05%	20%	TCD-1
9	C ₃ H ₈	0.05%	50%	TCD-3
10	C ₃ H ₆	0.05%	100%	TCD-3
11	C ₃ H ₈	0.05%	5%	TCD-3
12	i-C ₄ H ₁₀	0.05%	30%	TCD-3
13	n-C ₄ H ₁₀	0.05%	30%	TCD-3
14	trans-2-C ₄ H ₈	0.05%	10%	TCD-3
15	cis-2-C ₄ H ₈	0.05%	10%	TCD-3
16	1-C ₄ H ₈	0.05%	10%	TCD-3
17	i-C ₄ H ₈	0.05%	10%	TCD-3
18	i-C ₅ H ₁₂	0.05%	2%	TCD-3
19	n-C ₅ H ₁₂	0.05%	2%	TCD-3
20	1,3-C ₄ H ₆	0.05%	2%	TCD-3
21	C ₆ 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

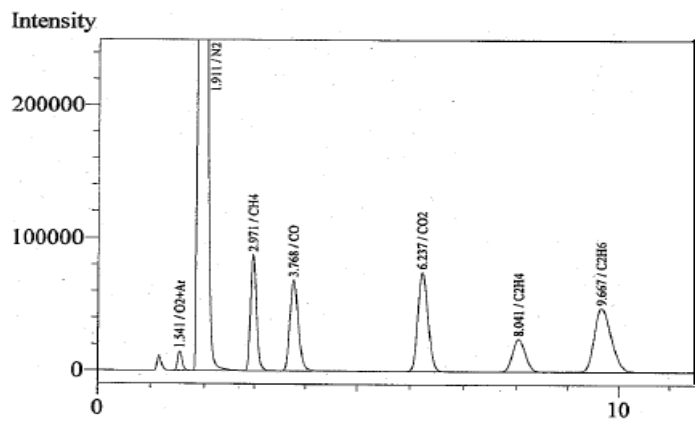


Fig. 1 Chromatogram of TCD-1

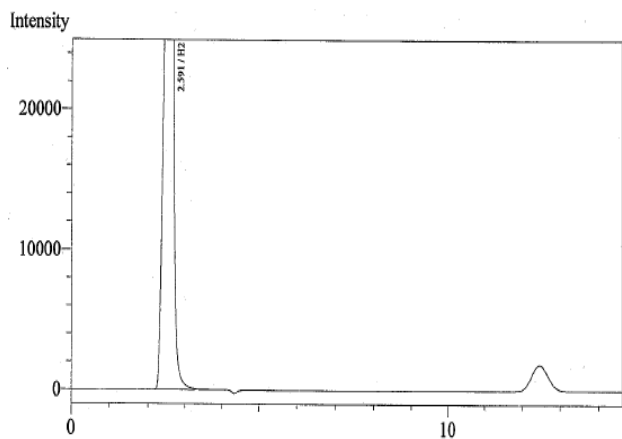


Fig. 2 Chromatogram of TCD-2

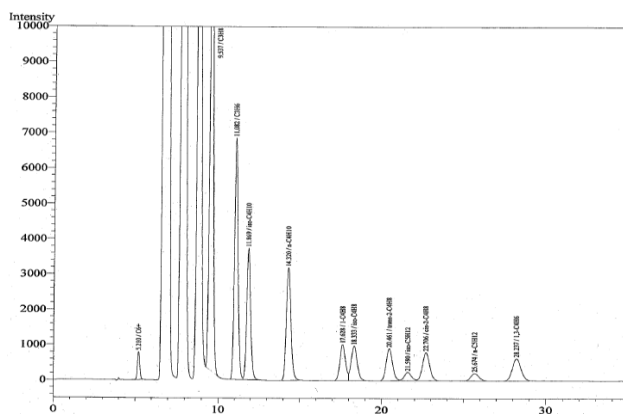


Fig. 3 Chromatogram of FID



Return to Table

Application Data Sheet

No. 79

System Gas Chromatograph

Gaseous Hydrocarbons Mixture Obtained from Refining Processes

Nexis GC-2030RGA2 GC-2014RGA2

Return to
Table

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:

H₂, O₂, N₂, Ar, CO, CO₂, C₁-C₅, C₆+

Methods met:

ASTM-D2163

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂	0.05%	100.00%	TCD-2
2	Ar+O ₂	0.05%	10.00%	TCD-1
3	N ₂	0.05%	100.00%	TCD-1
4	CH ₄	0.05%	50.00%	TCD-1
5	CO	0.05%	20.00%	TCD-1
6	CO ₂	0.05%	20.00%	TCD-1
7	C ₂ H ₆	0.05%	15.00%	TCD-1
8	H ₂ S	0.05%	5.00%	TCD-1
9	C ₂ H ₄	0.05%	20.00%	TCD-1
10	C ₃ H ₈	0.05%	50.00%	TCD-3
11	C ₃ H ₆	0.05%	100.00%	TCD-3
12	i-C ₄ H ₁₀	0.05%	30.00%	TCD-3
13	n-C ₄ H ₁₀	0.05%	30.00%	TCD-3
14	trans-2-C ₄ H ₈	0.05%	10.00%	TCD-3
15	cis-2-C ₄ H ₈	0.05%	10.00%	TCD-3
16	1-C ₄ H ₈	0.05%	10.00%	TCD-3
17	i-C ₄ H ₈	0.05%	10.00%	TCD-3
18	i-C ₅ H ₁₂	0.05%	2.00%	TCD-3
19	n-C ₅ H ₁₂	0.05%	2.00%	TCD-3
20	1,3-C ₄ H ₆	0.05%	2.00%	TCD-3
21	C ₆ 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

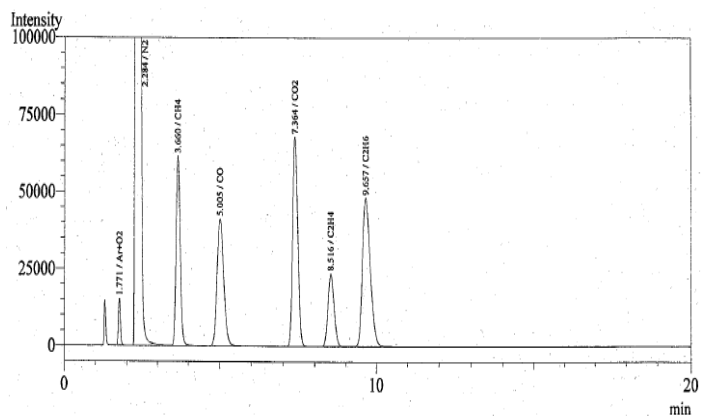


Fig. 1 Chromatogram of TCD-1

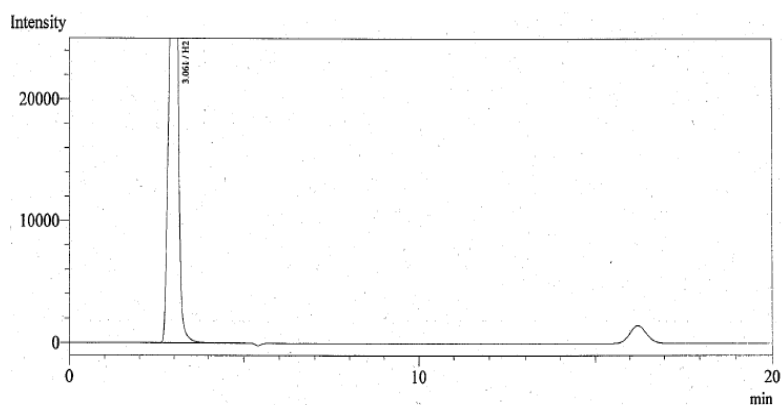


Fig. 2 Chromatogram of TCD-2

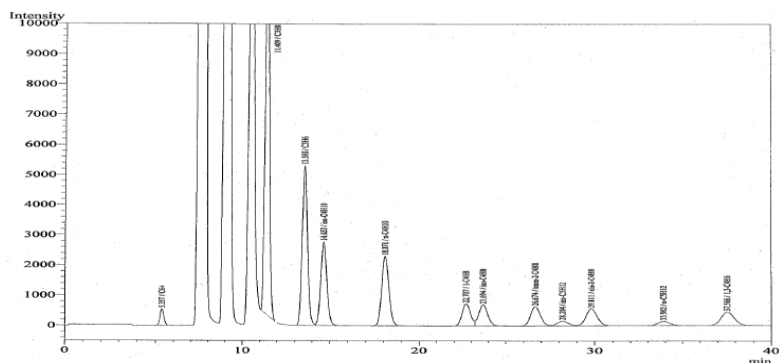


Fig. 3 Chromatogram of TCD-3



Return to Table

Application Data Sheet

No. 7

System Gas Chromatograph

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

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 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, H₂, O₂, N₂, CO, CO₂, H₂S, C₁-C₅, C₆+

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	H ₂	0.010%	10.0%
3	O ₂	0.010%	20.0%
4	N ₂	0.010%	50.0%
5	CH ₄	0.010%	80.0%
6	CO	0.010%	5.0%
7	CO ₂	0.010%	20.0%
8	C ₂ H ₄	0.010%	10.0%
9	C ₂ H ₆	0.010%	10.0%
10	C ₂ H ₂	0.010%	10.0%
11	H ₂ S	0.100%	30.0%
12	C ₃ H ₈	0.001%	5.0%
13	C ₃ H ₆	0.001%	5.0%
14	i-C ₄ H ₁₀	0.001%	1.0%
15	n-C ₄ H ₁₀	0.001%	1.0%
16	Other Hydrocarbons	0.001%	1.0%
17	C ₆ +	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 H₂ and He, and full range capability for H₂

Typical Chromatograms

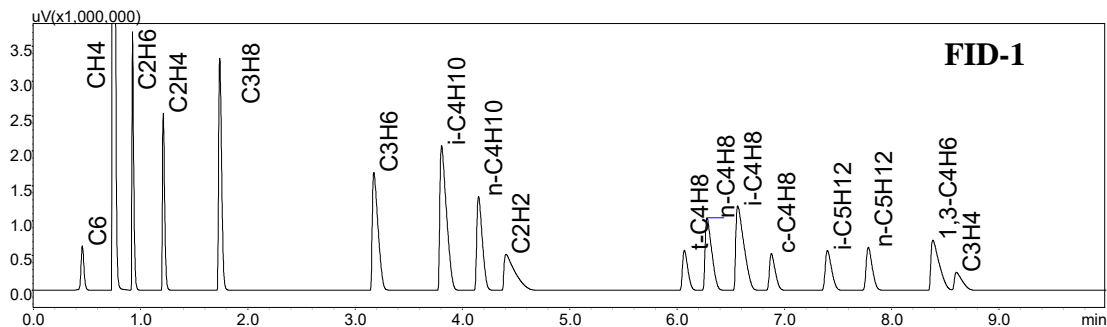


Fig. 1 Chromatogram of FID-1

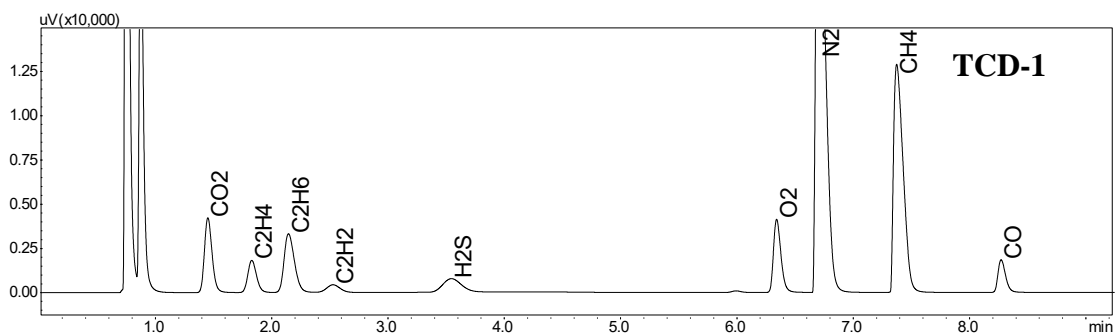


Fig. 2 Chromatogram of TCD-1

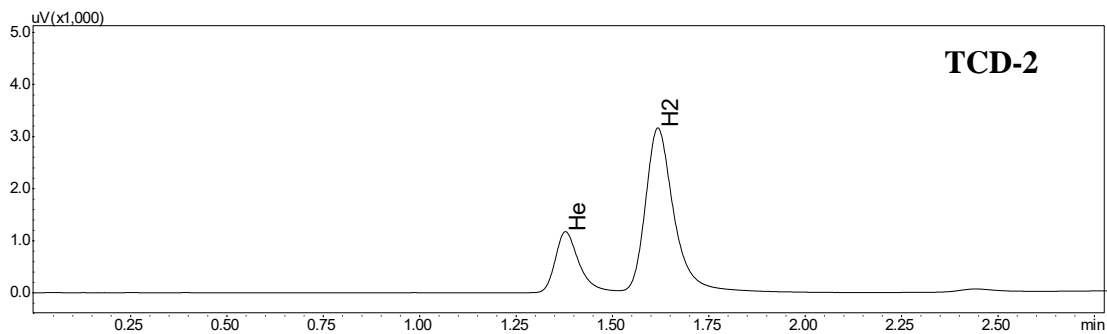


Fig. 3 Chromatogram of TCD-2



Application Data Sheet

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:

O₂, N₂, CO, CO₂, H₂S, C₁-C₅, C₆+

Detection Limits:

The lowest level of quantification for the permanent gases is 50ppm, H₂S 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	O ₂	0.010%	20.0%
2	N ₂	0.010%	50.0%
3	CH ₄	0.010%	80.0%
4	CO	0.010%	5.0%
5	CO ₂	0.010%	20.0%
6	C ₂ H ₄	0.010%	10.0%
7	C ₂ H ₆	0.010%	10.0%
8	C ₂ H ₂	0.010%	10.0%
9	H ₂ S	0.100%	30.0%
10	C ₃ H ₈	0.001%	5.0%
11	C ₃ H ₆	0.001%	5.0%
12	i-C ₄ H ₁₀	0.001%	1.0%
13	n-C ₄ H ₁₀	0.001%	1.0%
14	Propadiene(C ₃ H ₄)	0.001%	1.0%
15	Other Hydrocarbons	0.001%	0.5%
16	C ₆ +	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 H₂S analysis is required

Typical Chromatograms

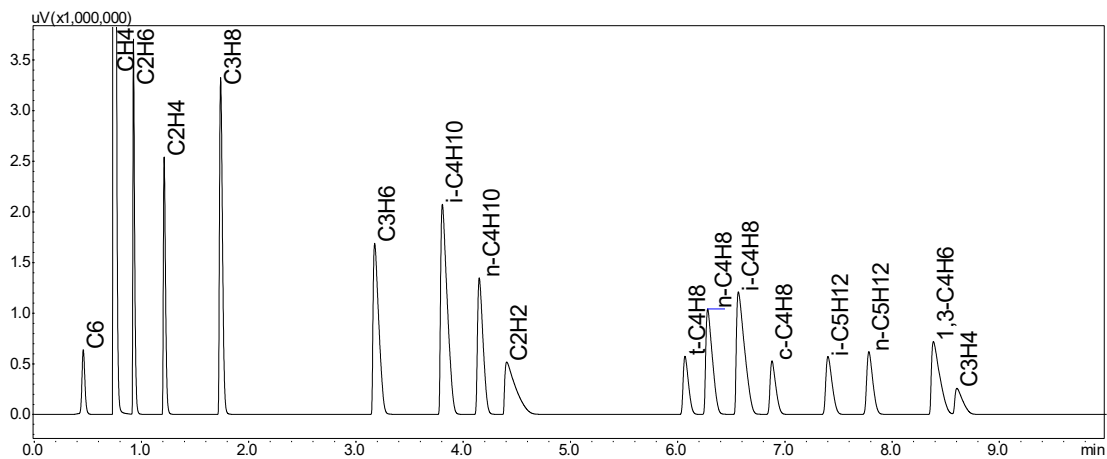


Fig. 1 Chromatogram of FID-1

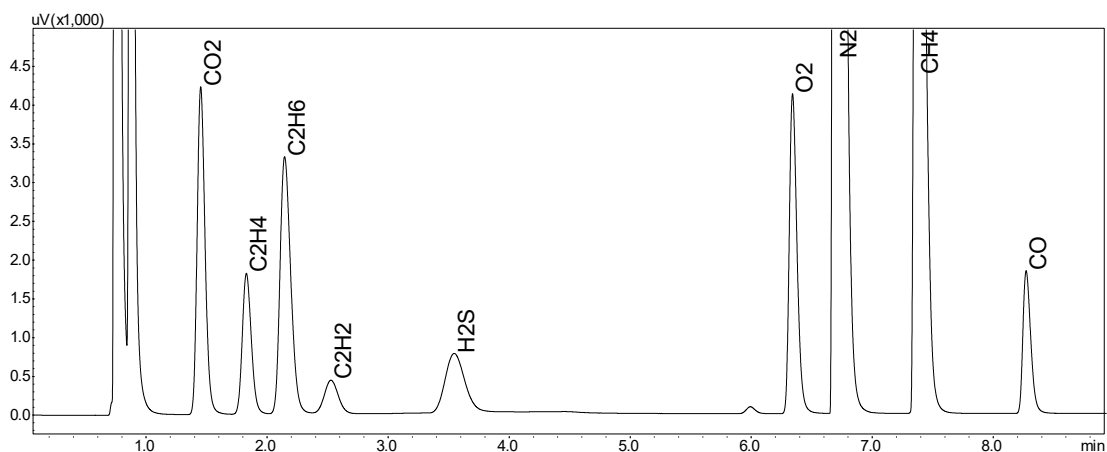


Fig. 2 Chromatogram of TCD

Return to Table

Application Data Sheet

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

Concentration Range:

Sample Information:

Permanent gas, C₁-C₆

Methods met:

ASTM-D1945, D3588, GPA-2261

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	He	0.010%	10.0%	TCD-2
2	H ₂	0.010%	10.0%	TCD-2
3	O ₂	0.010%	20.0%	TCD-1
4	N ₂	0.010%	50.0%	TCD-1
5	CH ₄	0.010%	80.0%	TCD-1
6	CO	0.010%	5.0%	TCD-1
7	CO ₂	0.010%	20.0%	TCD-1
8	C ₂ H ₄	0.010%	10.0%	TCD-1
9	C ₂ H ₆	0.010%	10.0%	TCD-1
10	C ₂ H ₂	0.010%	10.0%	TCD-1
11	H ₂ S	0.100%	30.0%	TCD-1
12	C ₃ H ₈	0.001%	5.0%	FID
13	C ₃ H ₆	0.001%	5.0%	FID
14	i-C ₄ H ₁₀	0.001%	1.0%	FID
15	n-C ₄ H ₁₀	0.001%	1.0%	FID
16	Propadiene(C ₃ H ₄)	0.001%	1.0%	FID
17	Trans-C ₄ H ₈	0.001%	0.5%	FID
18	1-C ₄ H ₈	0.001%	0.5%	FID
19	i-C ₄ H ₈	0.001%	0.5%	FID
20	Cis-2-C ₄ H ₈	0.001%	0.5%	FID
21	i-C ₅ H ₁₂	0.001%	0.5%	FID
22	n-C ₅ H ₁₂	0.001%	0.5%	FID
23	1,3-C ₄ H ₆	0.001%	0.5%	FID
24	C ₃ H ₄	0.001%	0.5%	FID
25	C ₆ +	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

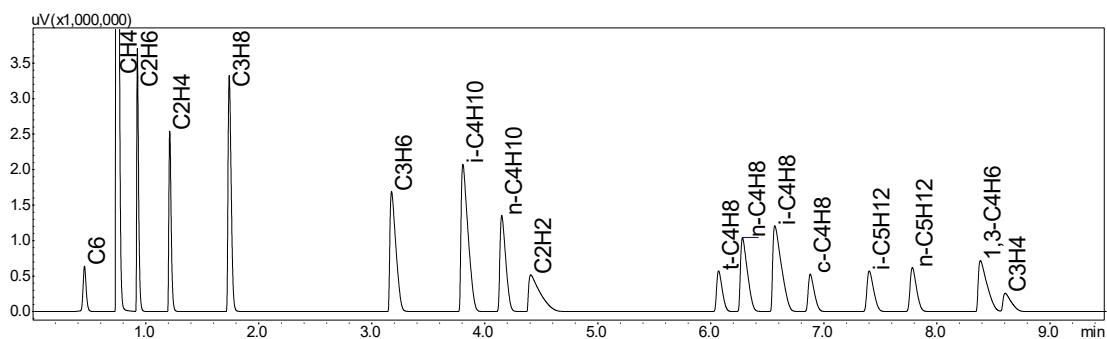


Fig.1 Chromatogram of FID

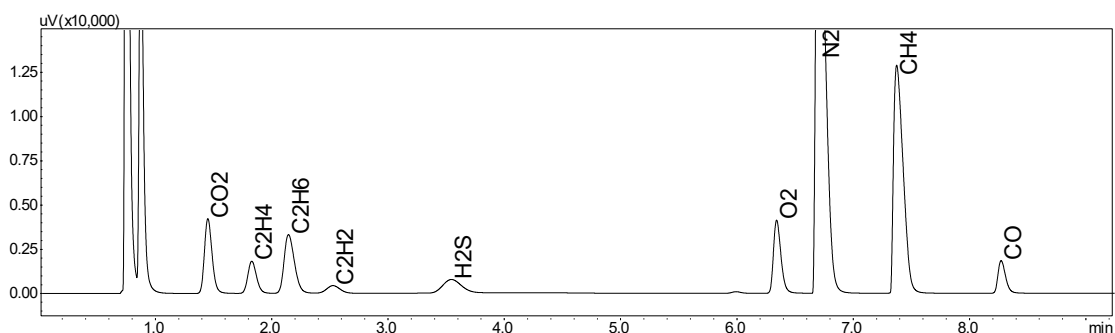


Fig.2 Chromatogram of TCD-1

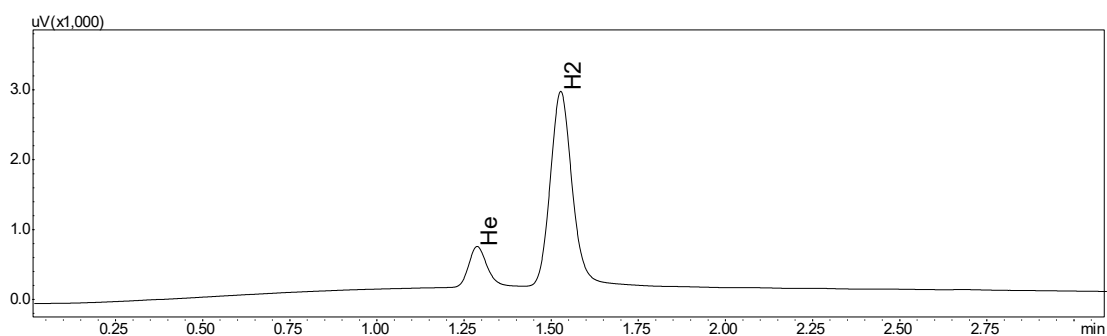


Fig.3 Chromatogram of TCD-2

First Edition: November, 2017



Application Data Sheet

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	O ₂	0.010%	20.0%	TCD-1
2	N ₂	0.010%	50.0%	TCD-1
3	CH ₄	0.010%	80.0%	TCD-1
4	CO	0.010%	5.0%	TCD-1
5	CO ₂	0.010%	20.0%	TCD-1
6	C ₂ H ₄	0.010%	10.0%	TCD-1
7	C ₂ H ₆	0.010%	10.0%	TCD-1
8	C ₂ H ₂	0.010%	10.0%	TCD-1
9	H ₂ S	0.100%	30.0%	TCD-1
10	C ₃ H ₈	0.001%	5.0%	FID
11	C ₃ H ₆	0.001%	5.0%	FID
12	i-C ₄ H ₁₀	0.001%	1.0%	FID
13	n-C ₄ H ₁₀	0.001%	1.0%	FID
14	Propadiene(C ₃ H ₄)	0.001%	1.0%	FID
15	Trans-C ₄ H ₈	0.001%	0.5%	FID
16	1-C ₄ H ₈	0.001%	0.5%	FID
17	i-C ₄ H ₈	0.001%	0.5%	FID
18	Cis-2-C ₄ H ₈	0.001%	0.5%	FID
19	i-C ₅ H ₁₂	0.001%	0.5%	FID
20	n-C ₅ H ₁₂	0.001%	0.5%	FID
21	1,3-C ₄ H ₆	0.001%	0.5%	FID
22	C ₃ H ₄	0.001%	0.5%	FID
23	C ₆ +	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

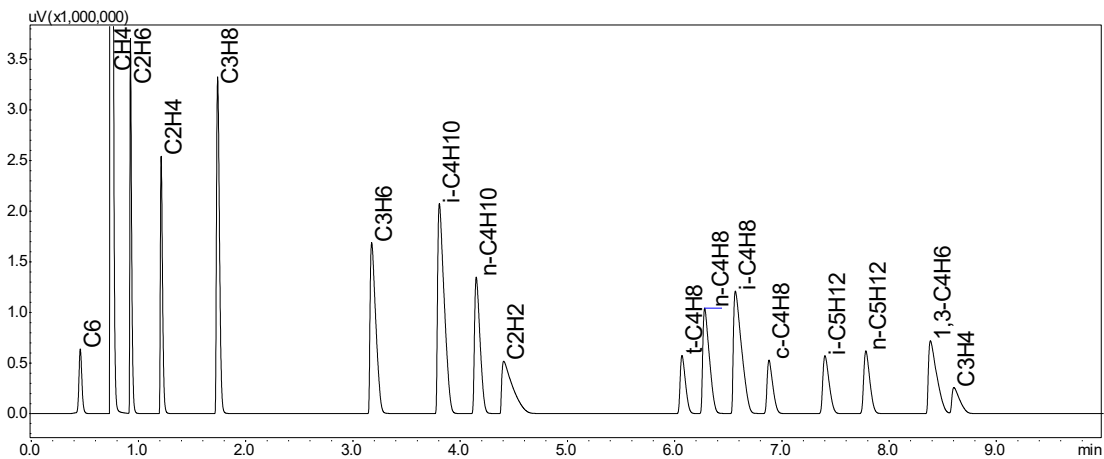


Fig.1 Chromatogram of FID

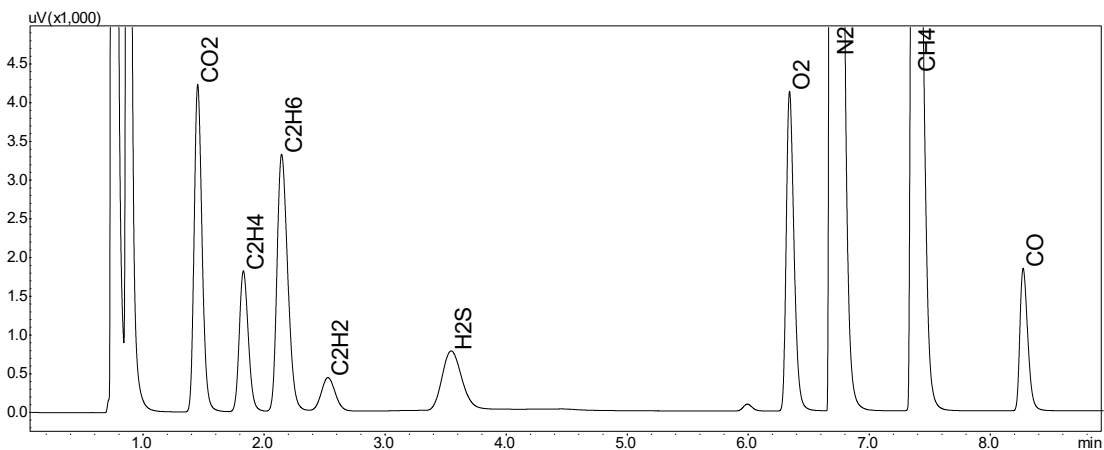


Fig. 2 Chromatogram of TCD

Return to Table

Application Data Sheet

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, H₂, O₂, N₂, CO, CO₂, H₂S, C₁-C₅, C₆+

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	H ₂	0.01%	80.0%
3	O ₂	0.01%	50.0%
4	N ₂	0.01%	50.0%
5	CH ₄	0.01%	80.0%
6	CO	0.01%	10.0%
7	CO ₂	0.01%	30.0%
8	C ₂ H ₄	0.01%	10.0%
9	C ₂ H ₆	0.01%	10.0%
10	C ₂ H ₂	0.01%	10.0%
11	H ₂ S	0.10%	30.0%
13	C ₃ H ₈	0.01%	5.0%
14	C ₃ H ₆	0.01%	5.0%
15	i-C ₄ H ₁₀	0.01%	1.0%
16	n-C ₄ H ₁₀	0.01%	1.0%
17	C ₃ H ₄	0.01%	1.0%
18	C ₂ H ₂	0.01%	1.0%
19	Other Hydrocarbons	0.01%	0.5%
20	C ₆ 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

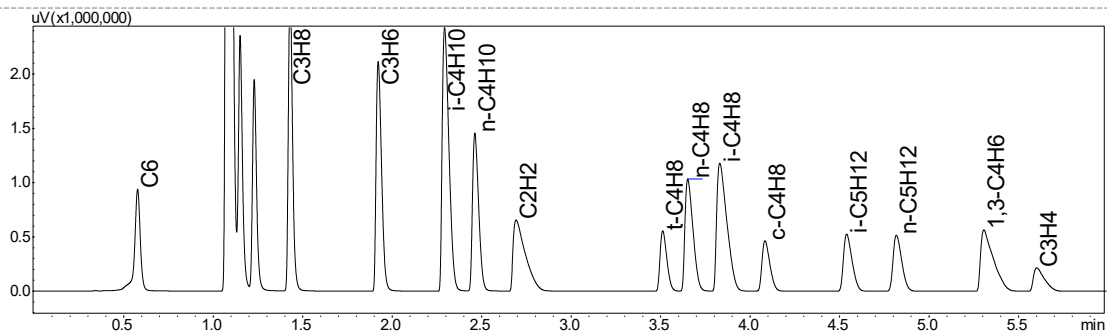


Fig. 1 Chromatogram of FID-1

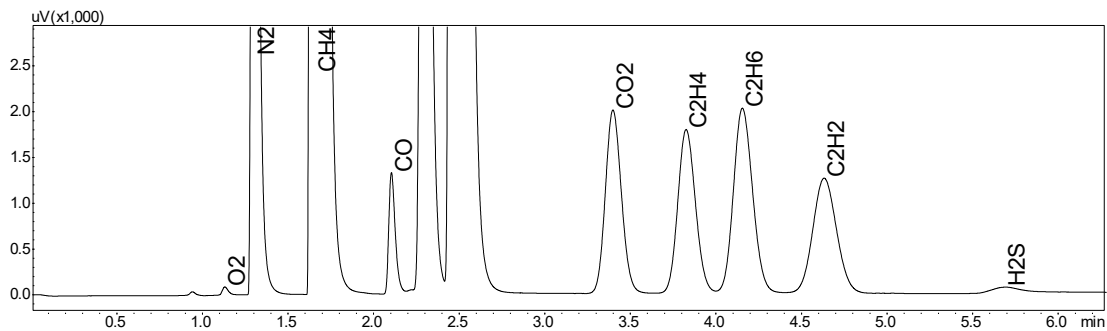


Fig. 2 Chromatogram of TCD-1

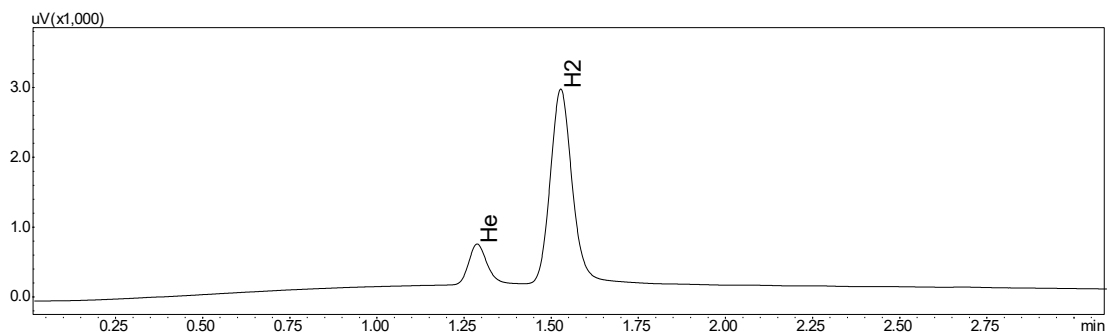


Fig. 3 Chromatogram of TCD-2



Application Data Sheet

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:

O₂, N₂, CO, CO₂, H₂S, C₁-C₅, C₆₊

Methods met:

ASTM-D1945, D1946, D3588, GPA-2261

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	O ₂	0.01%	50.0%
2	N ₂	0.01%	50.0%
3	CH ₄	0.01%	80.0%
4	CO	0.01%	10.0%
5	CO ₂	0.01%	30.0%
6	C ₂ H ₄	0.01%	10.0%
7	C ₂ H ₆	0.01%	10.0%
8	C ₂ H ₂	0.01%	10.0%
9	H ₂ S	0.10%	30.0%
10	C ₃ H ₈	0.01%	5.0%
11	C ₃ H ₆	0.01%	5.0%
12	i-C ₄ H ₁₀	0.01%	1.0%
13	n-C ₄ H ₁₀	0.01%	1.0%
14	C ₃ H ₄	0.01%	1.0%
15	C ₂ H ₂	0.01%	1.0%
16	Other Hydrocarbons	0.01%	0.5%
17	C ₆ 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

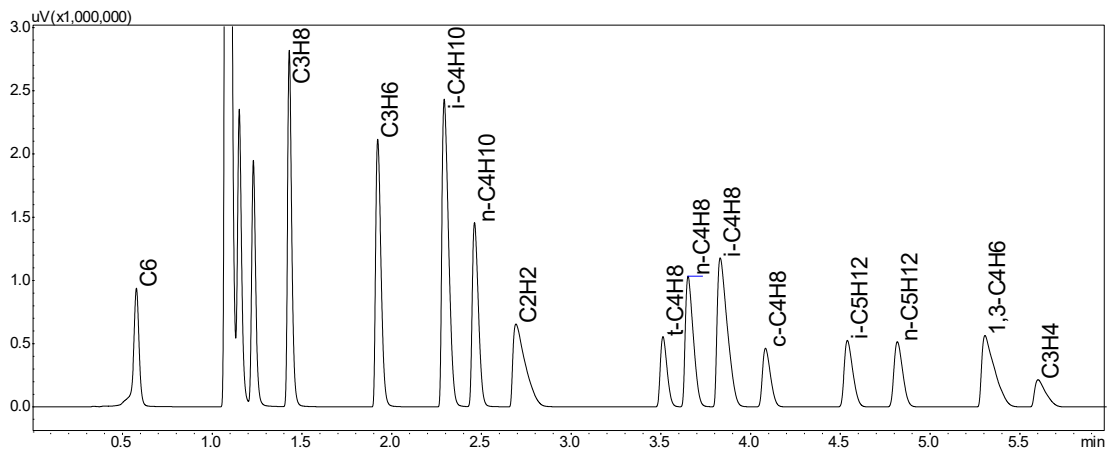


Fig. 1 Chromatogram of FID

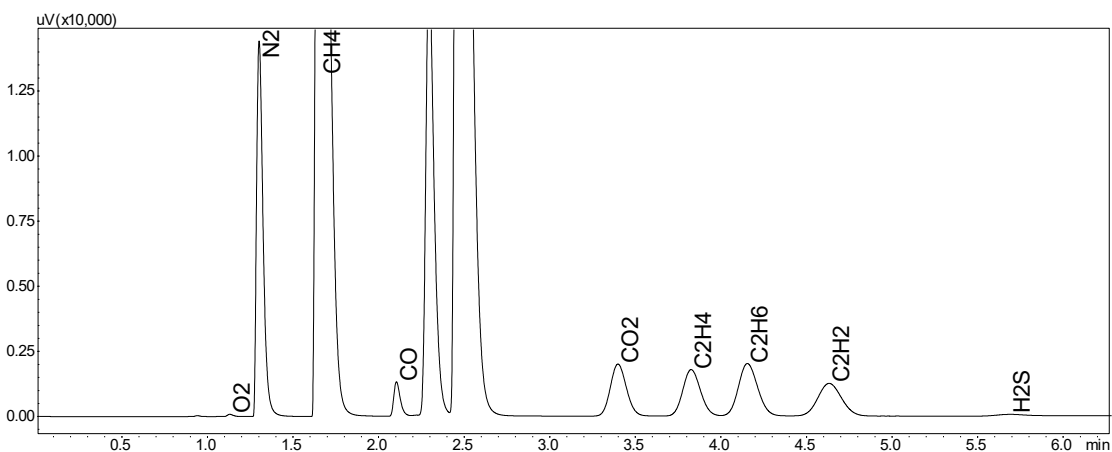


Fig. 2 Chromatogram of TCD



Application Data Sheet

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:

H₂, He, O₂, N₂, CO, CO₂, H₂S, C₁~C₁₃

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	H ₂	0.010%	10.0%
3	O ₂	0.010%	20.0%
4	N ₂	0.010%	50.0%
5	CH ₄	0.010%	10.0%
6	CO	0.010%	5.0%
7	CO ₂	0.010%	20.0%
8	C ₂ H ₄	0.010%	10.0%
9	C ₂ H ₆	0.010%	10.0%
10	C ₂ H ₂	0.010%	10.0%
11	H ₂ S	0.100%	30.0%
12	C ₃ H ₈	0.001%	5.0%
13	C ₃ H ₆	0.001%	5.0%
14	i-C ₄ H ₁₀	0.001%	1.0%
15	n-C ₄ H ₁₀	0.001%	1.0%
16	Propadiene	0.001%	1.0%
17	Other C ₄ and C ₅	0.001%	0.5%
18	C ₆ -C ₁₃	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

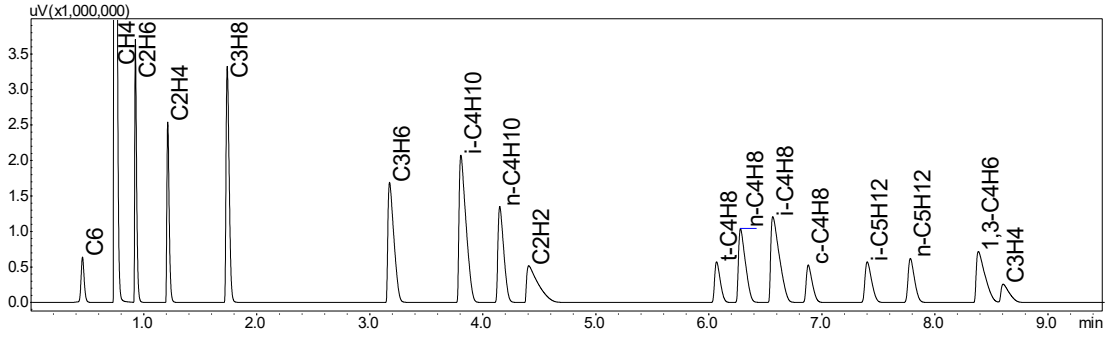


Fig. 1 Chromatogram of FID-1

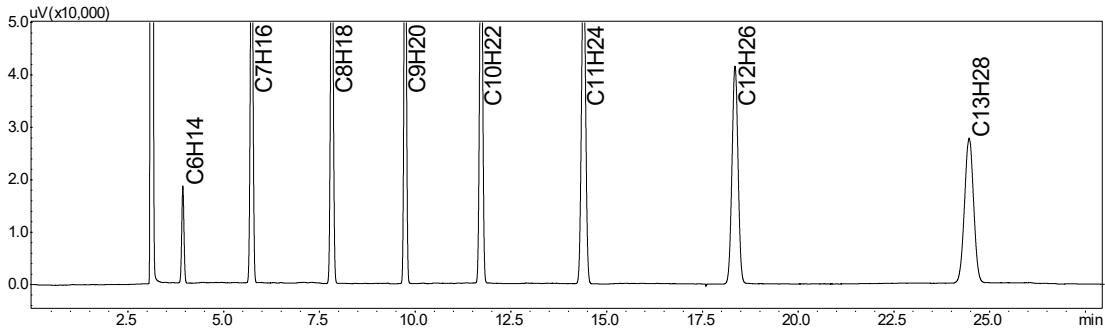


Fig. 2 Chromatogram of FID-2

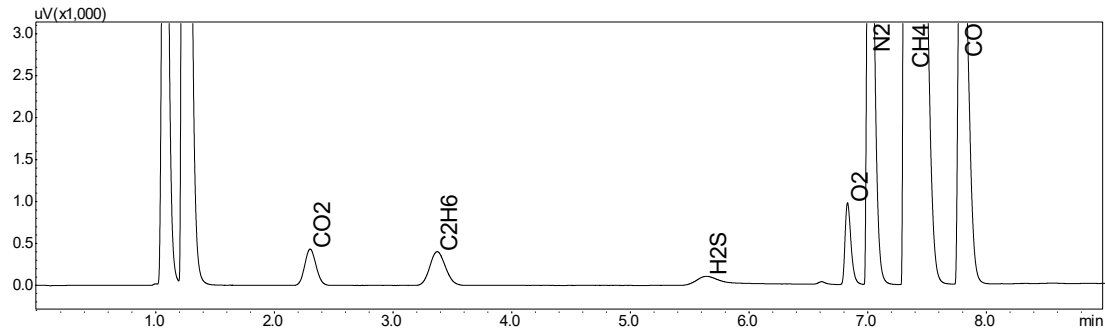


Fig. 3 Chromatogram of TCD-1

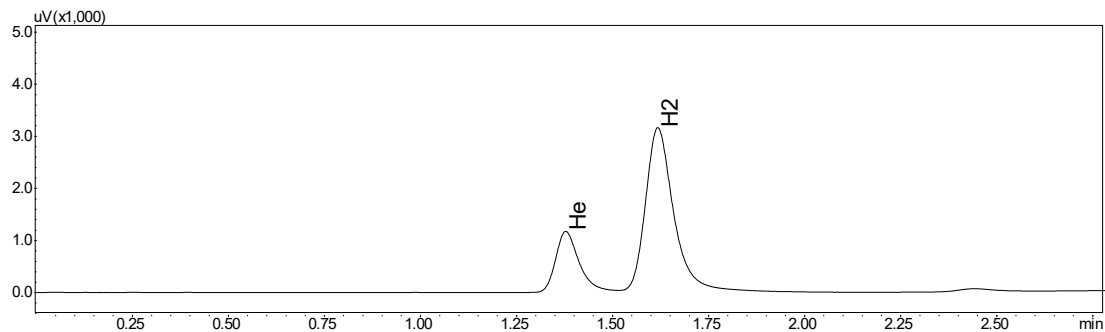


Fig. 4 Chromatogram of TCD-2

Application Data Sheet

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, CH₄ 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:

O₂, N₂, CO, CO₂, H₂S, C₁~C₁₃

Methods met:

ASTM-D1945, D1946, D3588, GPA-2261

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	O ₂	0.010%	20.0%
2	N ₂	0.010%	50.0%
3	CH ₄	0.010%	10.0%
4	CO	0.010%	5.0%
5	CO ₂	0.010%	20.0%
6	C ₂ H ₄	0.010%	10.0%
7	C ₂ H ₆	0.010%	10.0%
8	C ₂ H ₂	0.010%	10.0%
9	H ₂ S	0.100%	30.0%
10	C ₃ H ₈	0.001%	5.0%
11	C ₃ H ₆	0.001%	5.0%
12	i-C ₄ H ₁₀	0.001%	1.0%
13	n-C ₄ H ₁₀	0.001%	1.0%
14	Propadiene	0.001%	1.0%
15	Other C ₄ and C ₅	0.001%	0.5%
16	C ₆ -C ₁₃	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

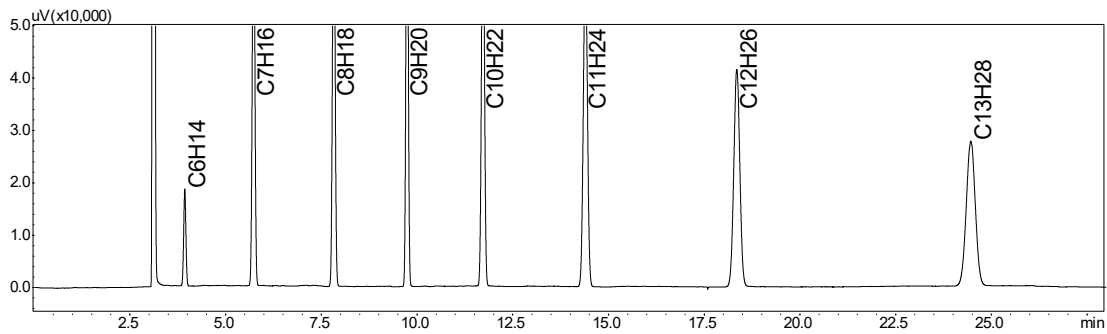


Fig. 1 Chromatogram of FID-1

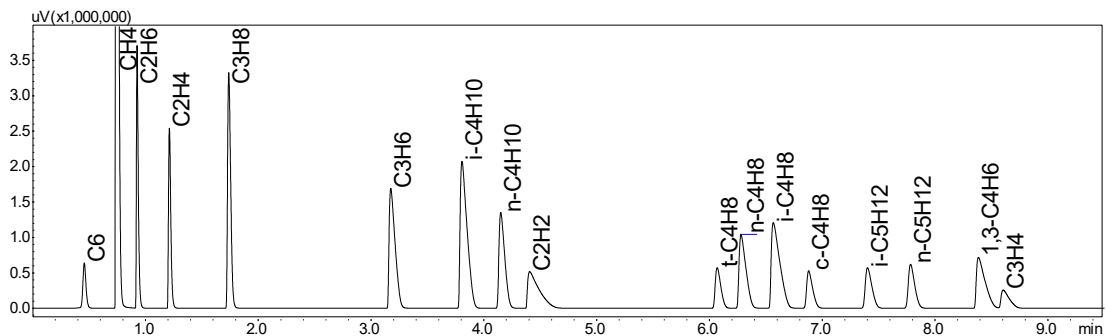


Fig. 2 Chromatogram of FID-2

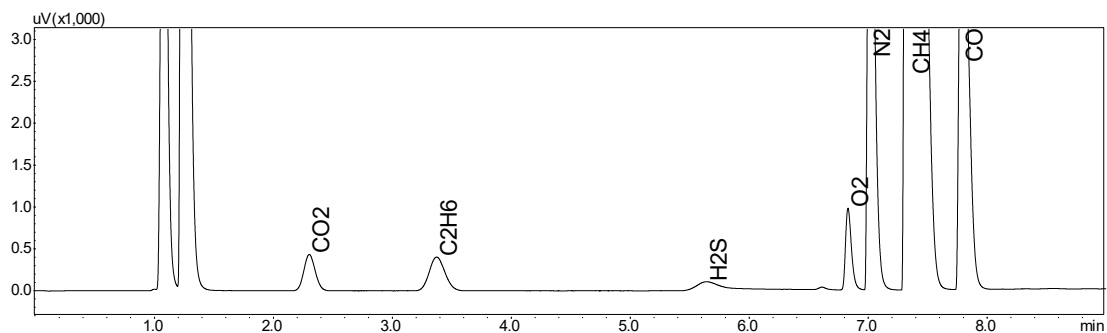


Fig. 3 Chromatogram of TCD-2



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 ₂ S, CO, CO ₂ , C1-C5, C6+(backflush)	BID, FID	16 minutes	No. 126
H ₂ , O ₂ , N ₂ , H ₂ S, CO, CO ₂ , C1-C5, C6-C13	BID, FIDx2	10 minutes	No. 127

« Return
to main page

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, H₂S

Concentration Range:

No.	Name of Compound	Concentration Range		Remarks
		Low Conc.	High Conc.	
1	H ₂	0.001%	10.0%	BID
2	O ₂	0.001%	10.0%	BID
3	N ₂	0.001%	10.0%	BID
4	CO	0.001%	10.0%	BID
5	CO ₂	0.001%	10.0%	BID
6	C ₂ H ₄	0.001%	10.0%	BID
7	C ₂ H ₆	0.001%	10.0%	BID
8	C ₂ H ₂	0.001%	10.0%	BID
9	H ₂ S	0.01%	30.0%	BID
10	CH ₄	0.01%	80.0%	FID
11	C ₃ H ₈	0.001%	5.0%	FID
13	C ₃ H ₆	0.001%	5.0%	FID
14	i-C ₄ H ₁₀	0.001%	1.0%	FID
15	n-C ₄ H ₁₀	0.001%	1.0%	FID
16	C ₃ H ₄	0.001%	1.0%	FID
17	C ₂ H ₂	0.001%	1.0%	FID
18	trans-C ₄ H ₈	0.001%	0.5%	FID
19	1-C ₄ H ₈	0.001%	0.5%	FID
20	i-C ₄ H ₈	0.001%	0.5%	FID
21	cis-C ₄ H ₈	0.001%	0.5%	FID
22	i-C ₅ H ₁₂	0.001%	0.5%	FID
23	n-C ₅ H ₁₂	0.001%	0.5%	FID
24	1,3-C ₄ H ₆	0.001%	0.5%	FID
25	C ₃ H ₄	0.001%	0.5%	FID
26	C ₆ 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

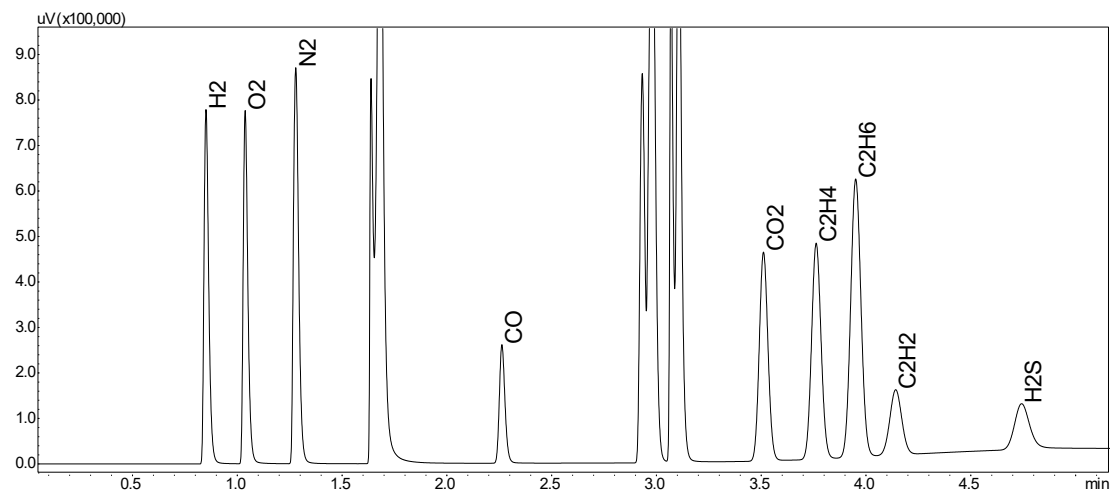


Fig. 1 Chromatogram of BID

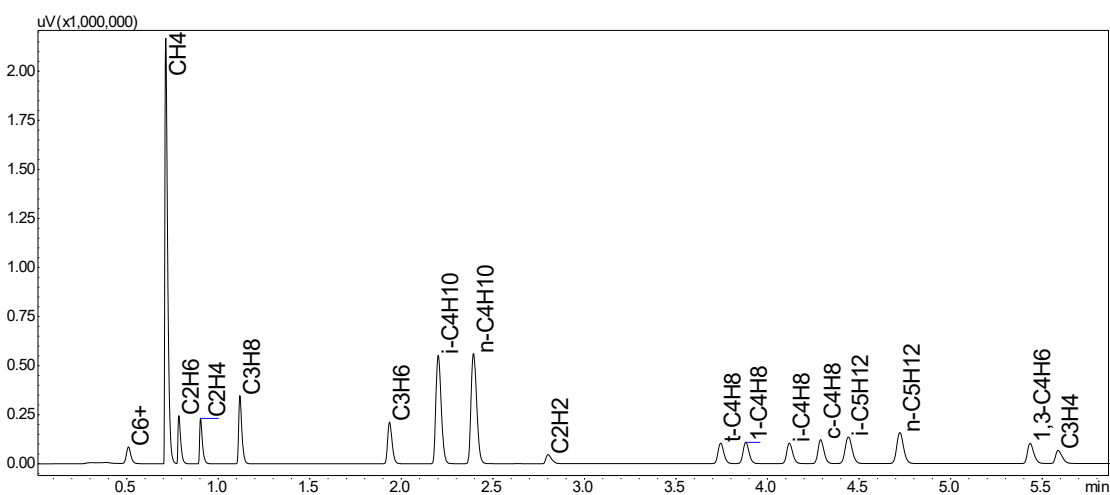


Fig. 2 Chromatogram of FID



Return to Table

Application Data Sheet

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 C1 through 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

Concentration Range:

Sample Information:

Permanent gas, C₁-C₁₃, H₂S

No.	Name of Compound	Concentration Range		Remarks
		Low Conc.	High Conc.	
1	H ₂	0.001%	80.0%	BID
2	O ₂	0.001%	50.0%	BID
3	N ₂	0.001%	50.0%	BID
4	CO	0.001%	10.0%	BID
5	CO ₂	0.001%	30.0%	BID
6	C ₂ H ₄	0.001%	10.0%	BID
7	C ₂ H ₆	0.001%	10.0%	BID
8	C ₂ H ₂	0.001%	10.0%	BID
9	H ₂ S	0.01%	30.0%	BID
10	CH ₄	0.001%	80.0%	FID-1
11	C ₃ H ₈	0.001%	5.0%	FID-1
13	C ₃ H ₆	0.001%	5.0%	FID-1
14	i-C ₄ H ₁₀	0.001%	1.0%	FID-1
15	n-C ₄ H ₁₀	0.001%	1.0%	FID-1
16	C ₃ H ₄	0.001%	1.0%	FID-1
17	C ₂ H ₂	0.001%	1.0%	FID-1
18	trans-C ₄ H ₈	0.001%	0.5%	FID-1
19	1-C ₄ H ₈	0.001%	0.5%	FID-1
20	i-C ₄ H ₈	0.001%	0.5%	FID-1
21	cis-C ₄ H ₈	0.001%	0.5%	FID-1
22	i-C ₅ H ₁₂	0.001%	0.5%	FID-1
23	n-C ₅ H ₁₂	0.001%	0.5%	FID-1
24	1,3-C ₄ H ₆	0.001%	0.5%	FID-1
25	C ₃ H ₄	0.001%	0.5%	FID-1
26	C ₆ plus	0.001%	0.5%	FID-1
27	C ₆ – C ₁₃	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

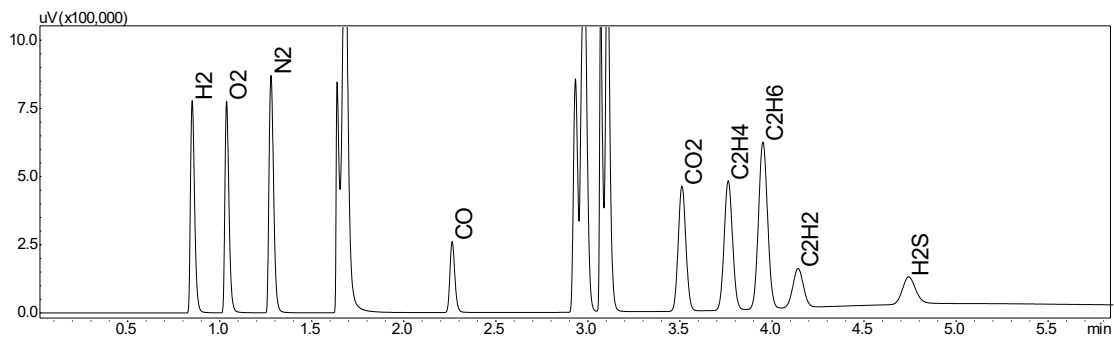


Fig. 1 Chromatogram of BID

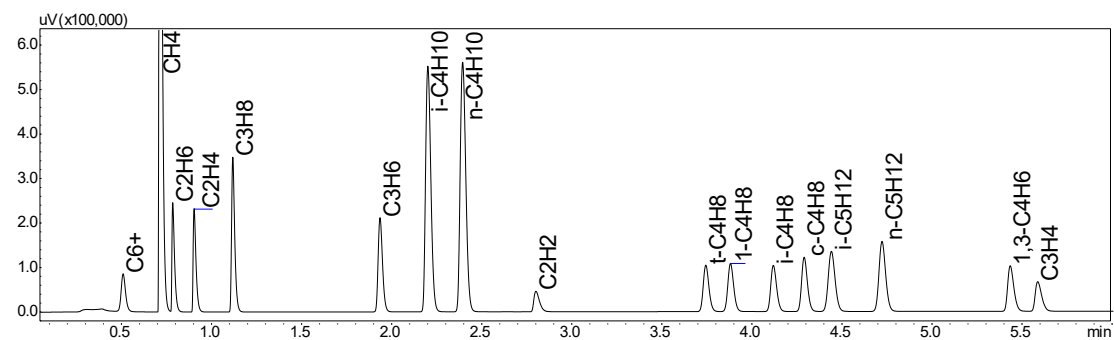


Fig. 2 Chromatogram of FID-1

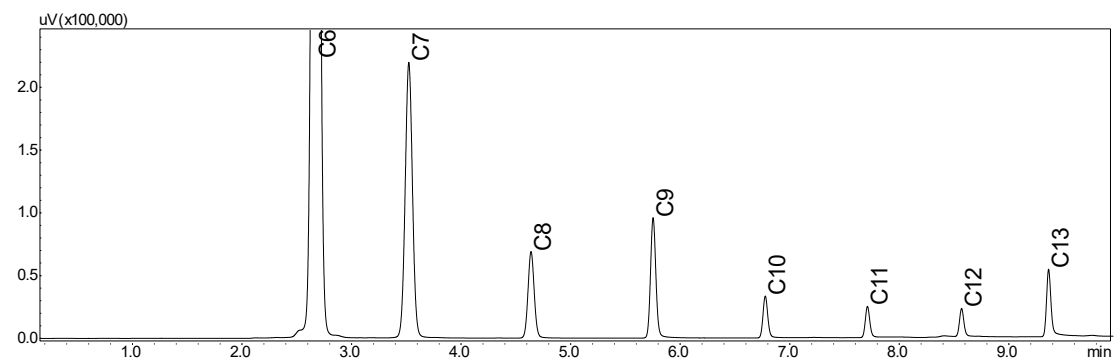


Fig. 3 Chromatogram of FID-2



Return to Table

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 ₂ S, C6+(backflush)	BID, FID	5 minutes	No. 125
ASTM-D1945, ASTM-D3588, GPA- 2261	H ₂ , O ₂ , N ₂ , CO, CO ₂ , H ₂ S, C1-C5, C6+(backflush)	TCDx2, FID	10 minutes	No. 118
ASTM-D1945, ASTM-D3588, GPA- 2261	O ₂ , N ₂ , CO, CO ₂ , H ₂ S, 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 ₂ S, C1- C5, C6+ (backflush)	TCDx2, FID	10 minutes	No. 3
ASTM-D1945, ASTM-D3588, GPA- 2261	O ₂ , N ₂ , CO, CO ₂ , H ₂ S, 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 ₂ S, C1- C14	TCDx2, FID	30 minutes	No. 5
ASTM-D1945, ASTM-D3588, GPA- 2261	H ₂ , O ₂ , N ₂ , CO, CO ₂ , H ₂ S, 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 ₂ S, C1-C5	TCD	23 minutes	No. 1
ASTM-D1945, ASTM-D3588	O ₂ , N ₂ , CO, CO ₂ , H ₂ S, 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

« Return
to main page

Application Data Sheet

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, H₂S

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂	0.001%	10.0%	BID
2	O ₂	0.001%	10.0%	BID
3	N ₂	0.001%	10.0%	BID
4	CO	0.001%	10.0%	BID
5	CO ₂	0.001%	10.0%	BID
6	C ₂ H ₄	0.001%	10.0%	BID
7	C ₂ H ₆	0.001%	10.0%	BID
8	C ₂ H ₂	0.001%	10.0%	BID
9	H ₂ S	0.01%	10.0%	BID
10	CH ₄	0.01%	80.0%	FID
11	C ₃ H ₈	0.001%	10.0%	FID
12	i-C ₄ H ₁₀	0.001%	10.0%	FID
13	n-C ₄ H ₁₀	0.001%	10.0%	FID
14	i-C ₅ H ₁₂	0.001%	2.0%	FID
15	n-C ₅ H ₁₂	0.001%	2.0%	FID
16	C ₆ +	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

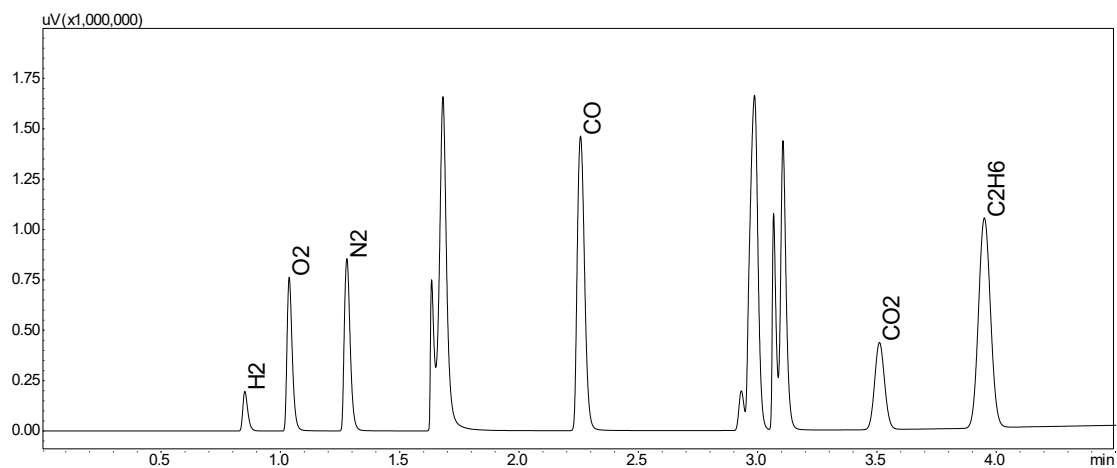


Fig. 1 Chromatogram of BID

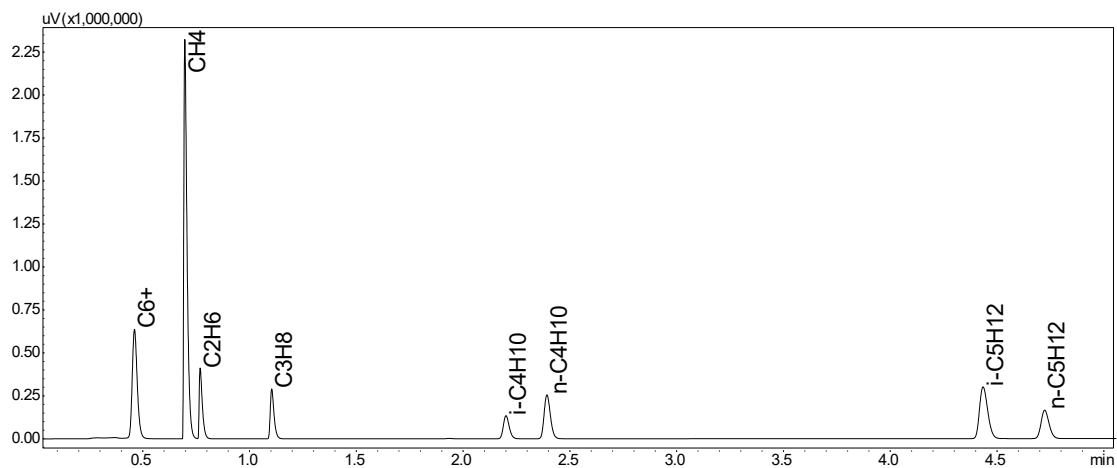


Fig. 2 Chromatogram of FID



Application Data Sheet

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	H ₂	0.010%	10.0%	TCD-2
3	O ₂	0.010%	20.0%	TCD-1
4	N ₂	0.010%	50.0%	TCD-1
5	CH ₄	20.000%	100.0%	TCD-1
6	CO	0.010%	5.0%	TCD-1
7	CO ₂	0.010%	20.0%	TCD-1
8	C ₂ H ₆	0.010%	10.0%	TCD-1
9	H ₂ S	0.100%	30.0%	TCD-1
10	C ₃ H ₈	0.001%	10.0%	FID
11	i-C ₄ H ₁₀	0.001%	10.0%	FID
12	n-C ₄ H ₁₀	0.001%	10.0%	FID
13	i-C ₅ H ₁₂	0.001%	2.0%	FID
14	n-C ₅ H ₁₂	0.001%	2.0%	FID
15	C ₆ +	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

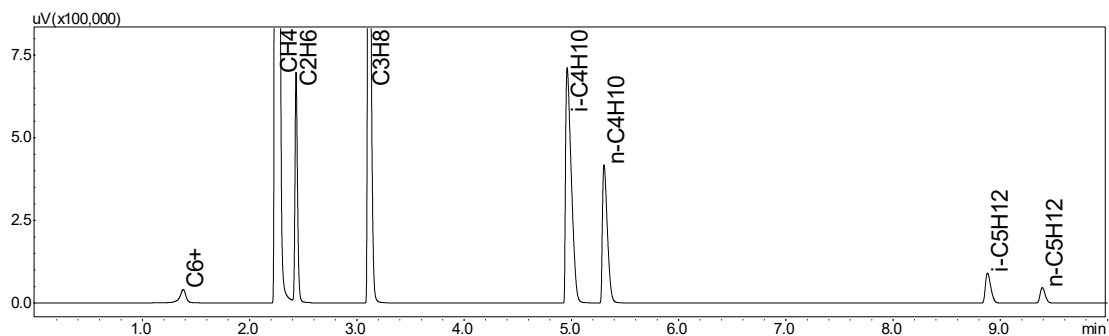


Fig.1 Chromatogram of FID

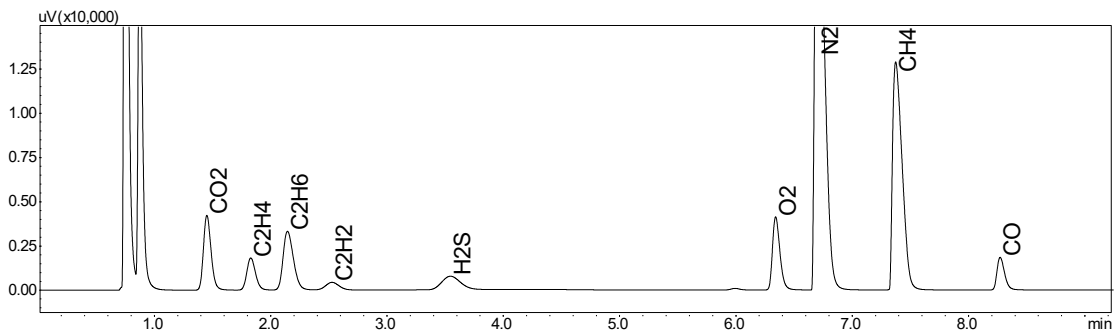


Fig.2 Chromatogram of TCD-1

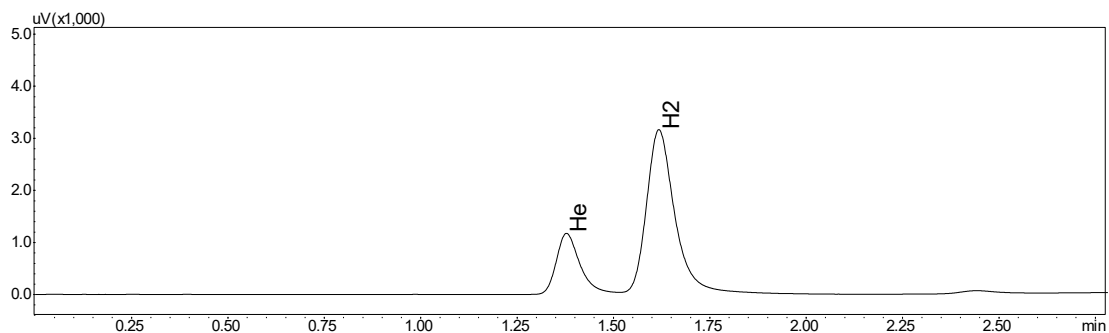


Fig.3 Chromatogram of TCD-2

First Edition: November, 2017



Return to Table

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	O ₂	0.010%	20.0%	TCD-1
2	N ₂	0.010%	50.0%	TCD-1
3	CH ₄	20.000%	100.0%	TCD-1
4	CO	0.010%	5.0%	TCD-1
5	CO ₂	0.010%	20.0%	TCD-1
6	C ₂ H ₆	0.010%	10.0%	TCD-1
7	H ₂ S	0.100%	30.0%	TCD-1
8	C ₃ H ₈	0.001%	10.0%	FID
9	i-C ₄ H ₁₀	0.001%	10.0%	FID
10	n-C ₄ H ₁₀	0.001%	10.0%	FID
11	i-C ₅ H ₁₂	0.001%	2.0%	FID
12	n-C ₅ H ₁₂	0.001%	2.0%	FID
13	C ₆ +	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

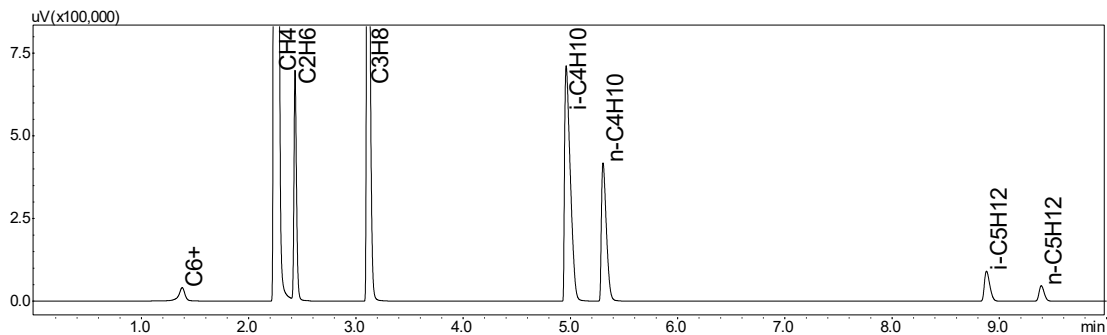


Fig.1 Chromatogram of FID



Return to Table

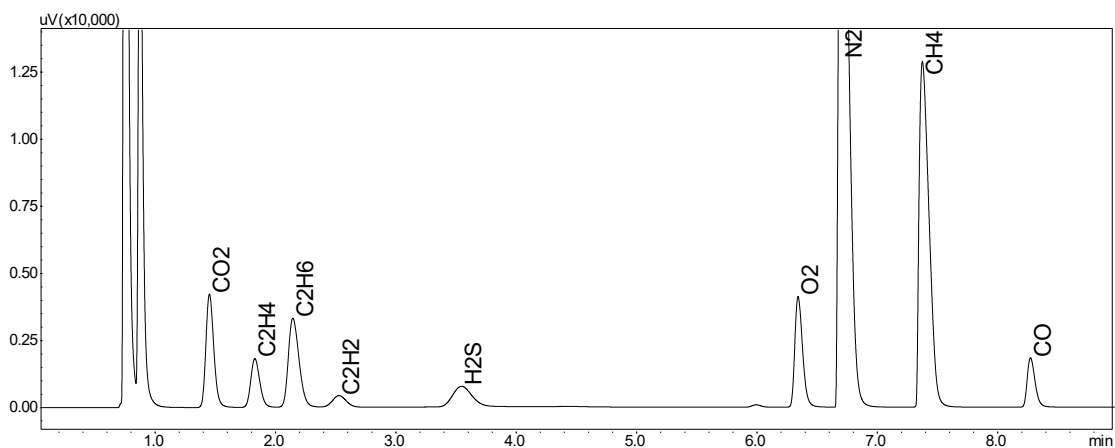


Fig.2 Chromatogram of TCD

Application Data Sheet

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, H₂, O₂, N₂, CO, CO₂, H₂S, C₁-C₅ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), C₆₊ 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	H ₂	0.010%	10.0%
3	O ₂	0.010%	20.0%
4	N ₂	0.010%	50.0%
5	CH ₄	20.000%	100.0%
6	CO	0.010%	5.0%
7	CO ₂	0.010%	20.0%
8	C ₂ H ₆	0.010%	10.0%
9	H ₂ S	0.100%	30.0%
10	C ₃ H ₈	0.001%	10.0%
11	i-C ₄ H ₁₀	0.001%	10.0%
12	n-C ₄ H ₁₀	0.001%	10.0%
13	i-C ₅ H ₁₂	0.001%	2.0%
14	n-C ₅ H ₁₂	0.001%	2.0%
15	C ₆₊	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

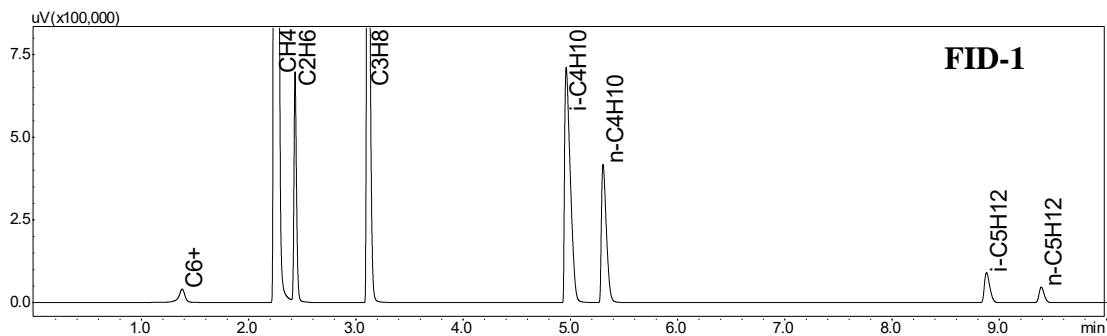


Fig. 1 Chromatogram of FID-1

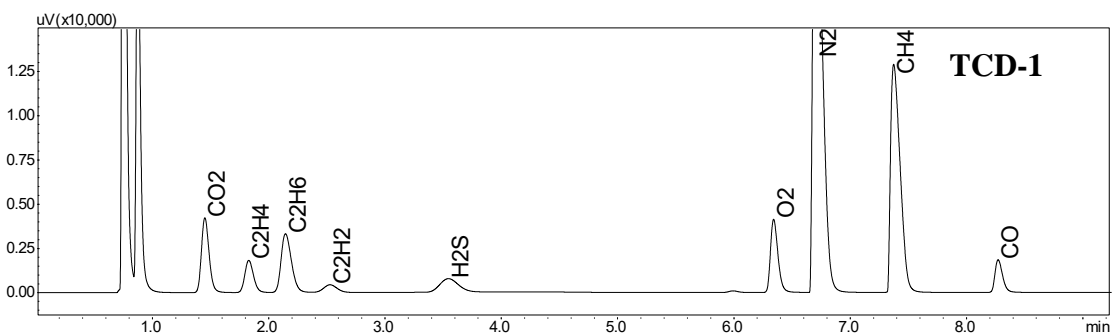


Fig. 2 Chromatogram of TCD-1

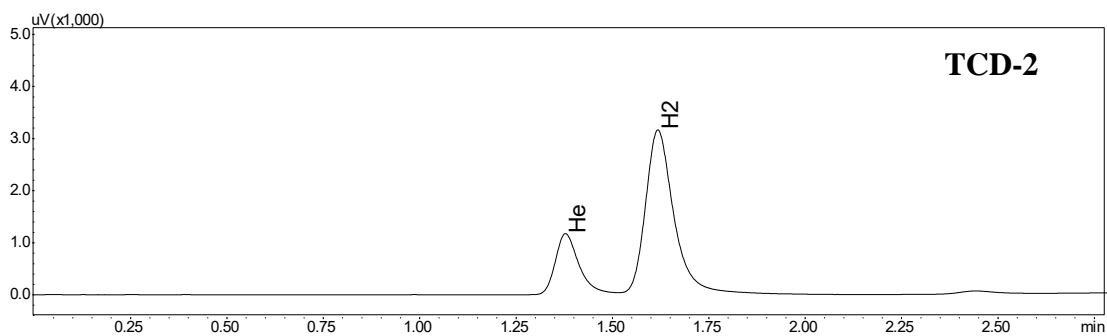


Fig. 3 Chromatogram of TCD-2



Return to Table

Application Data Sheet

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 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:

O₂, N₂, CO, CO₂, H₂S, C₁-C₅ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), C₆₊ by backflush

Methods met:

ASTM-D1945, D3588, GPA-2261

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	O ₂	0.010%	20.0%
2	N ₂	0.010%	50.0%
3	CH ₄	20.000%	100.0%
4	CO	0.010%	5.0%
5	CO ₂	0.010%	20.0%
6	C ₂ H ₆	0.010%	10.0%
7	H ₂ S	0.100%	30.0%
8	C ₃ H ₈	0.001%	10.0%
9	i-C ₄ H ₁₀	0.001%	10.0%
10	n-C ₄ H ₁₀	0.001%	10.0%
11	i-C ₅ H ₁₂	0.001%	2.0%
12	n-C ₅ H ₁₂	0.001%	2.0%
13	C ₆₊	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

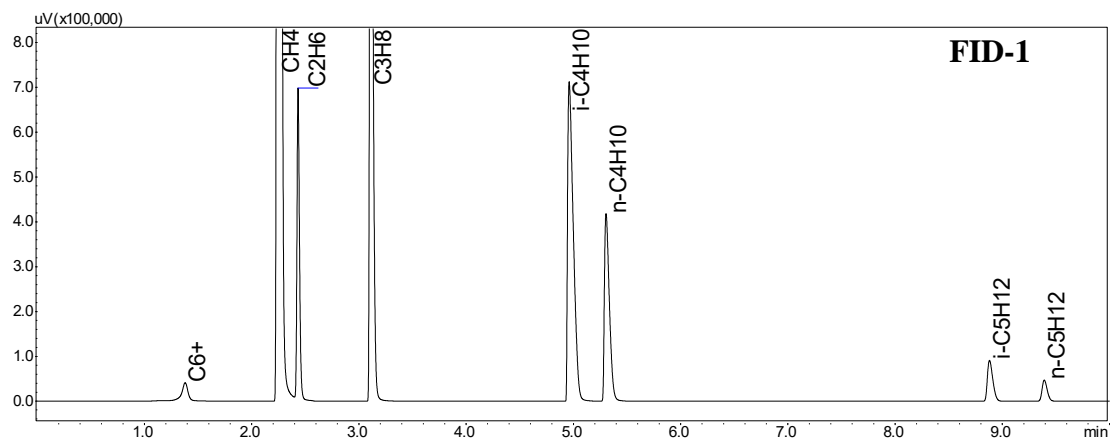


Fig. 1 Chromatogram of FID-1

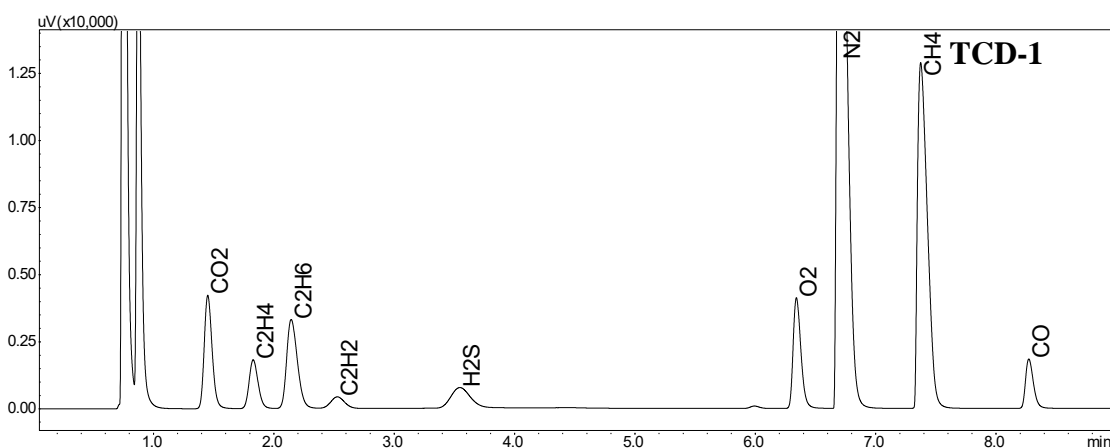


Fig. 2 Chromatogram of TCD-1

Return to Table

Application Data Sheet

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. 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 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, H₂, O₂, N₂, CO, CO₂, H₂S, C₁~C₁₄

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	H ₂	0.010%	10.0%
3	O ₂	0.010%	20.0%
4	N ₂	0.010%	50.0%
5	CH ₄	20.000%	100.0%
6	CO	0.010%	5.0%
7	CO ₂	0.010%	20.0%
8	C ₂ H ₆	0.010%	10.0%
9	H ₂ S	0.100%	30.0%
10	C ₃ H ₈	0.001%	10.0%
11	i-C ₄ H ₁₀	0.001%	10.0%
12	n-C ₄ H ₁₀	0.001%	10.0%
13	i-C ₅ H ₁₂	0.001%	2.0%
14	n-C ₅ H ₁₂	0.001%	2.0%
15	C ₆ through C ₁₃	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

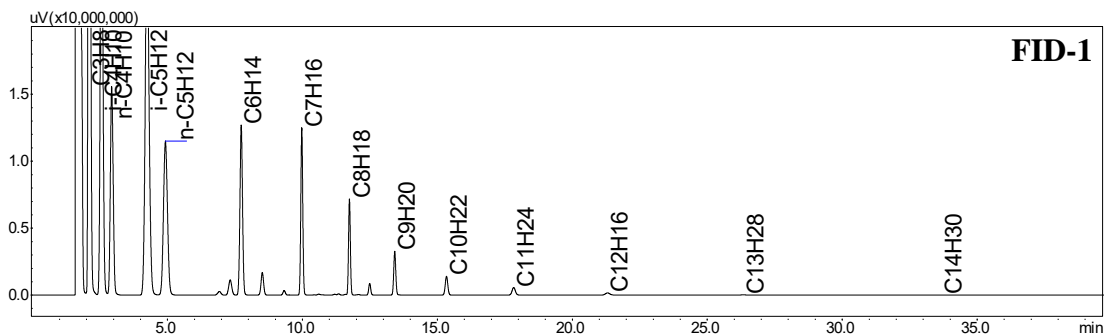


Fig. 1 Chromatogram of FID-1

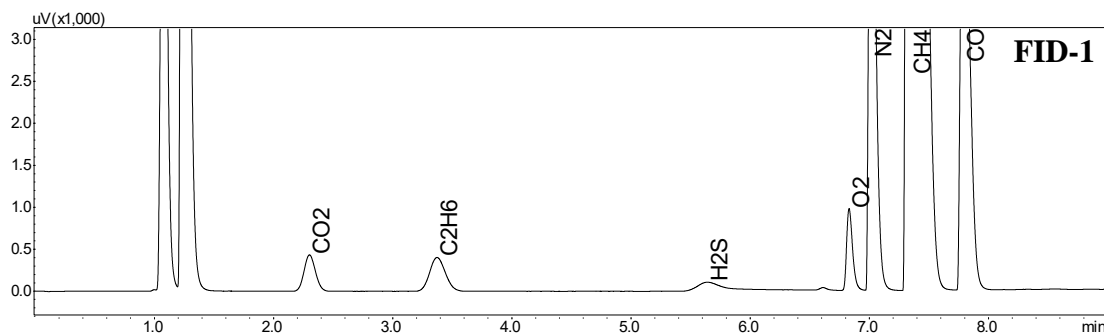


Fig. 2 Chromatogram of TCD-1

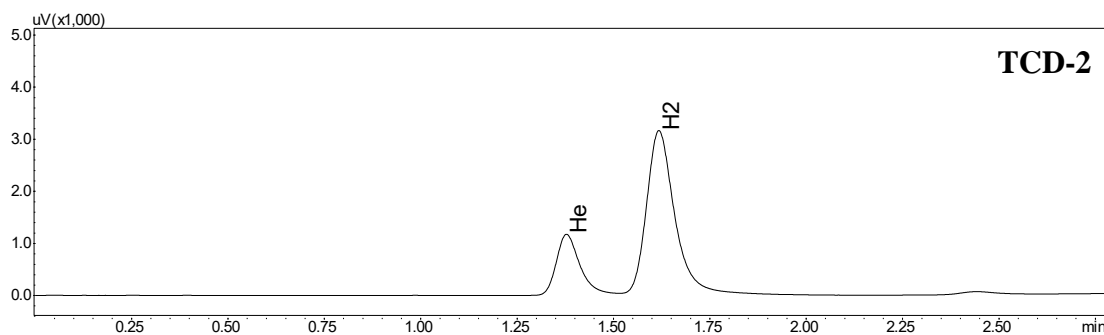


Fig. 3 Chromatogram of TCD-2



Application Data Sheet

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:

H₂, O₂, N₂, CO, CO₂, H₂S, C₁~C₁₈

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	H ₂	0.010%	10.0%
3	O ₂	0.010%	20.0%
4	N ₂	0.010%	50.0%
5	CH ₄	20.000%	100.0%
6	CO	0.010%	5.0%
7	CO ₂	0.010%	20.0%
8	C ₂ H ₆	0.010%	10.0%
9	H ₂ S	0.100%	30.0%
10	C ₃ H ₈	0.001%	10.0%
11	i-C ₄ H ₁₀	0.001%	10.0%
12	n-C ₄ H ₁₀	0.001%	10.0%
13	i-C ₅ H ₁₂	0.001%	2.0%
14	n-C ₅ H ₁₂	0.001%	2.0%
15	C ₆ through C ₁₈	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

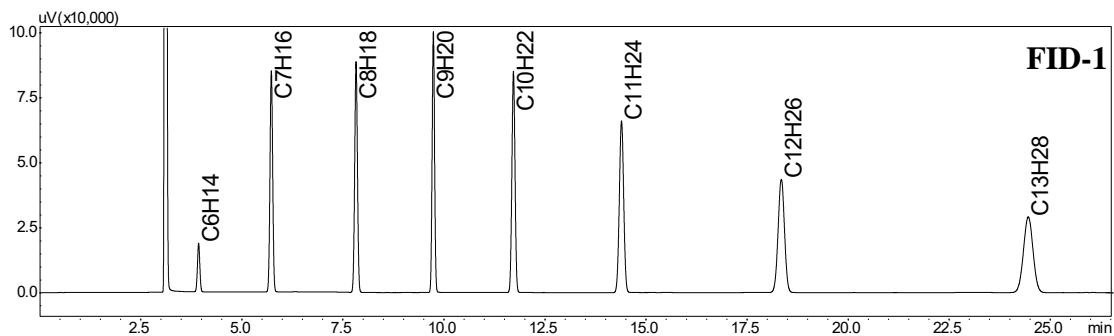


Fig. 1 Chromatogram of FID-1

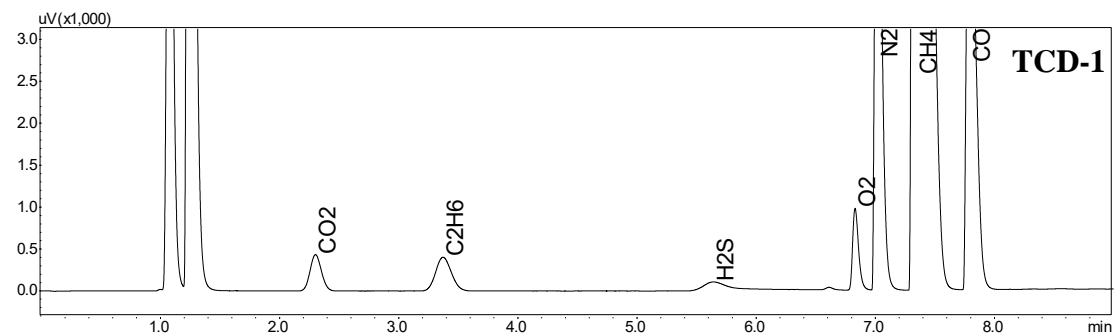


Fig. 2 Chromatogram of TCD-1

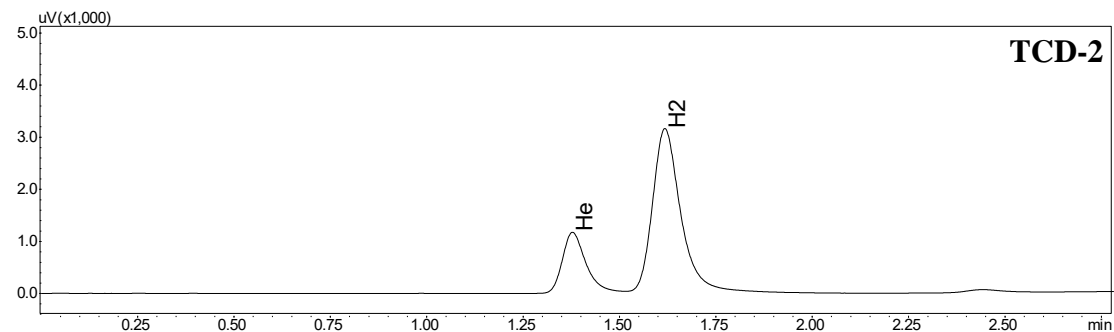


Fig. 3 Chromatogram of TCD-2

Return to Table

Application Data Sheet

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, H₂, O₂, N₂, CO, CO₂, H₂S, C₁-C₅ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), C₆₊ 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	H ₂	0.01%	10.0%
3	O ₂	0.01%	20.0%
4	N ₂	0.01%	50.0%
5	CH ₄	20.0%	100%
6	CO	0.01%	5.0%
7	CO ₂	0.01%	20.0%
8	C ₂ H ₆	0.01%	10.0%
9	C ₃ H ₈	0.01%	10.0%
10	i-C ₄ H ₁₀	0.01%	10.0%
11	n-C ₄ H ₁₀	0.01%	2.0%
12	i-C ₅ H ₁₂	0.01%	10.0%
13	n-C ₅ H ₁₂	0.01%	2.0%
14	H ₂ S	0.10%	30.0%
15	C ₆₊	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 H₂
- Good repeatability

Typical Chromatograms

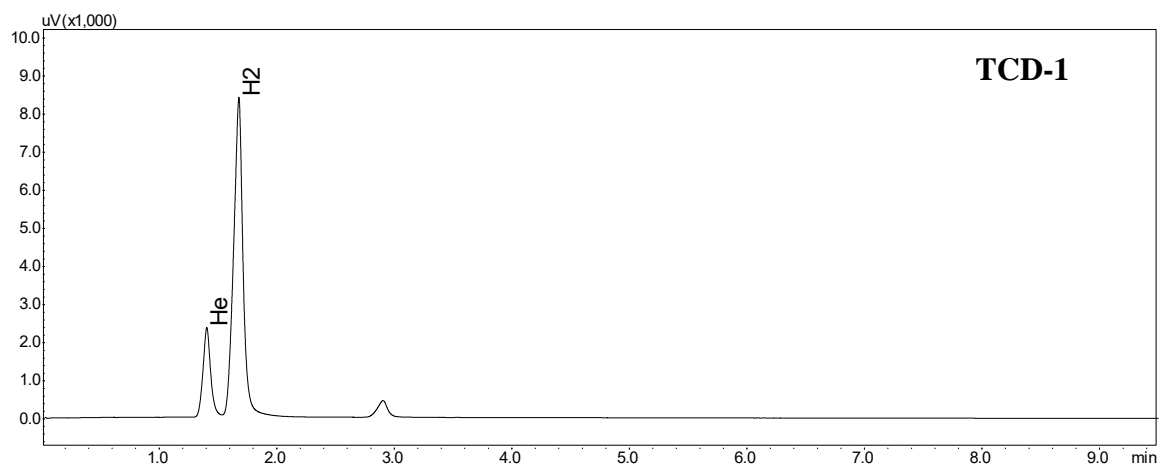


Fig. 1 Chromatogram of TCD-1

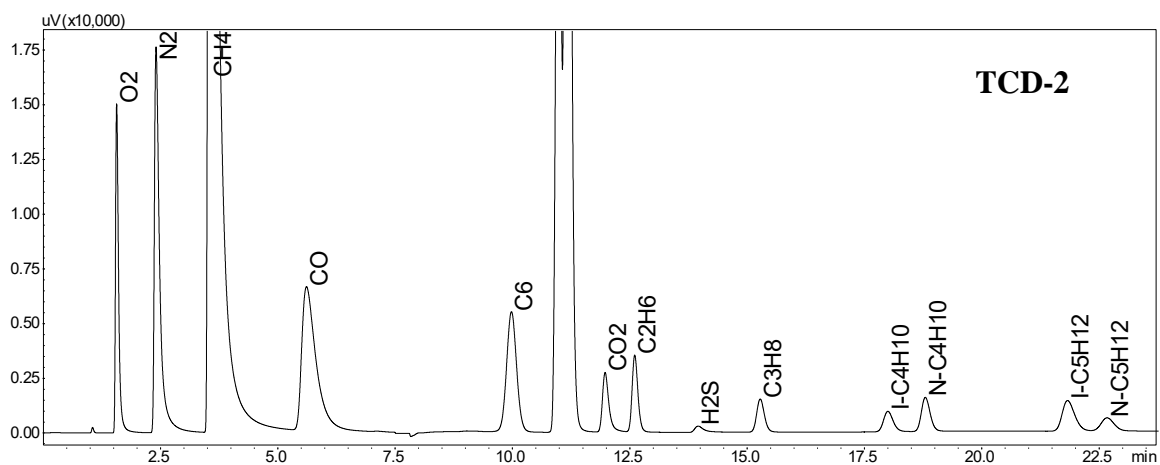


Fig. 2 Chromatogram of TCD-2



Return to Table

Application Data Sheet

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:

O₂, N₂, CO, CO₂, H₂S, C₁-C₅ (methane, ethane, propane, iso-butane, n-butane, iso-pentane, and n-pentane), C₆₊ by backflush

Methods met:

ASTM-D1945, D3588

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	O ₂	0.01%	20.0%
2	N ₂	0.01%	50.0%
3	CH ₄	20.0%	100.0%
4	CO	0.01%	5.0%
5	CO ₂	0.01%	20.0%
6	C ₂ H ₆	0.01%	10.0%
7	C ₃ H ₈	0.01%	10.0%
8	i-C ₄ H ₁₀	0.01%	10.0%
9	n-C ₄ H ₁₀	0.01%	10.0%
10	i-C ₅ H ₁₂	0.01%	2.0%
11	n-C ₅ H ₁₂	0.01%	2.0%
12	H ₂ S	0.10%	30.0%
13	C ₆₊	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

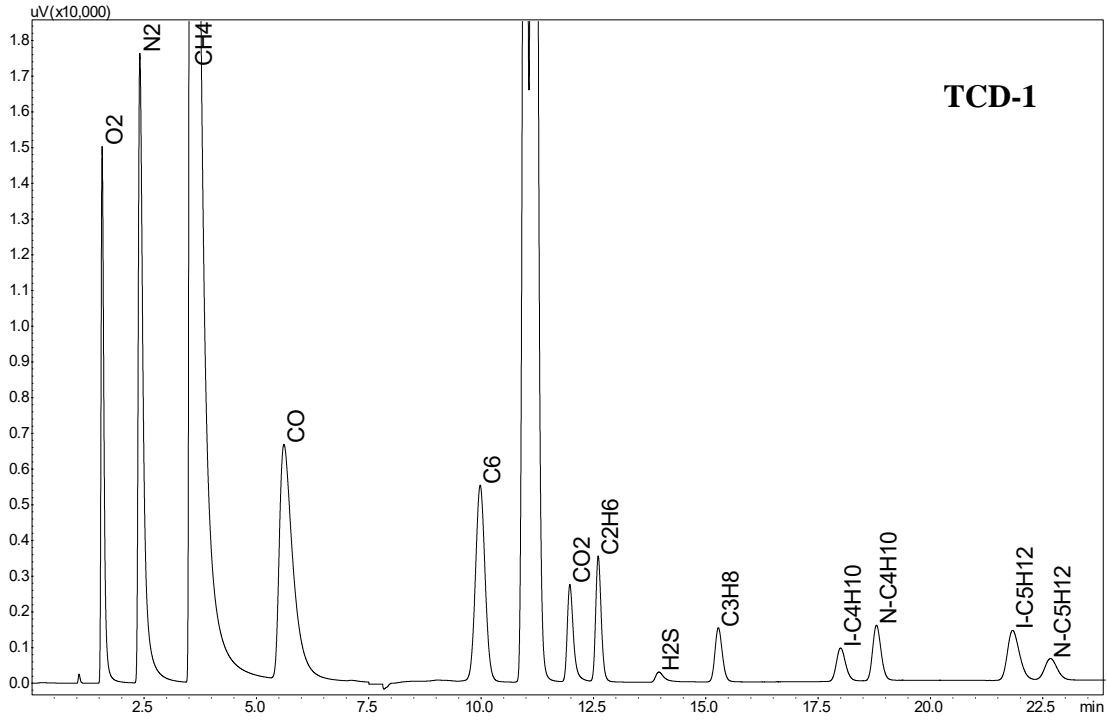


Fig. 1 Chromatogram of TCD-1

Return to Table

Application Data Sheet

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 Lab-Solutions GC workstation software.

Analyzer Information

System Configuration:

One 10-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	CH ₄	0.010%	80.0%	FID
2	C ₂ H ₆	0.001%	5.0%	FID
3	C ₃ H ₈	0.001%	5.0%	FID
4	C ₃ H ₆	0.001%	5.0%	FID
5	C ₂ H ₂	0.001%	5.0%	FID
6	i-C ₄ H ₁₀	0.001%	1.0%	FID
7	n-C ₄ H ₁₀	0.001%	1.0%	FID
8	Propadiene	0.001%	1.0%	FID
9	Trans-C ₄ H ₈	0.001%	0.5%	FID
10	1-C ₄ H ₈	0.001%	0.5%	FID
11	Cis-2-C ₄ H ₈	0.001%	0.5%	FID
12	i-C ₅ H ₁₂	0.001%	0.5%	FID
13	n-C ₅ H ₁₂	0.001%	0.5%	FID
14	1,3-C ₄ H ₆	0.001%	0.5%	FID
15	C ₃ H ₄	0.001%	0.5%	FID
16	C ₆ +	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

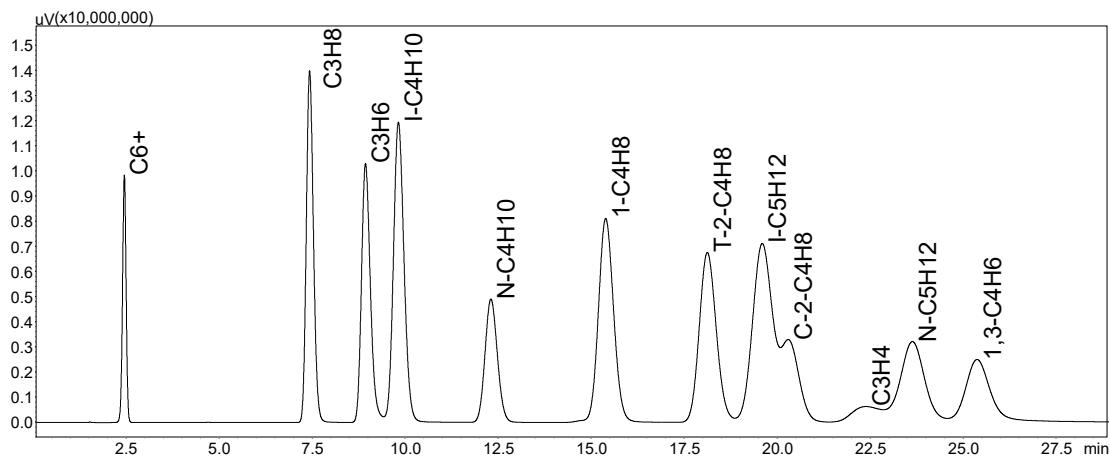


Fig. Chromatogram of FID

Return to Table

Application Data Sheet

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 used in 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:

One 10-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	CH ₄	0.001%	80.0%	FID
2	C ₂ H ₄	0.001%	10.0%	FID
3	C ₂ H ₆	0.001%	10.0%	FID
4	C ₂ H ₂	0.001%	10.0%	FID
5	C ₃ H ₈	0.001%	5.0%	FID
6	C ₃ H ₆	0.001%	5.0%	FID
7	i-C ₄ H ₁₀	0.001%	1.0%	FID
8	n-C ₄ H ₁₀	0.001%	1.0%	FID
9	Propadiene(C ₃ H ₄)	0.001%	1.0%	FID
10	Trans-C ₄ H ₈	0.001%	0.5%	FID
11	1-C ₄ H ₈	0.001%	0.5%	FID
12	i-C ₄ H ₈	0.001%	0.5%	FID
13	Cis-2-C ₄ H ₈	0.001%	0.5%	FID
14	i-C ₅ H ₁₂	0.001%	0.5%	FID
15	n-C ₅ H ₁₂	0.001%	0.5%	FID
16	1,3-C ₄ H ₆	0.001%	0.5%	FID
17	C ₃ H ₄	0.001%	0.5%	FID
18	C ₆ +	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

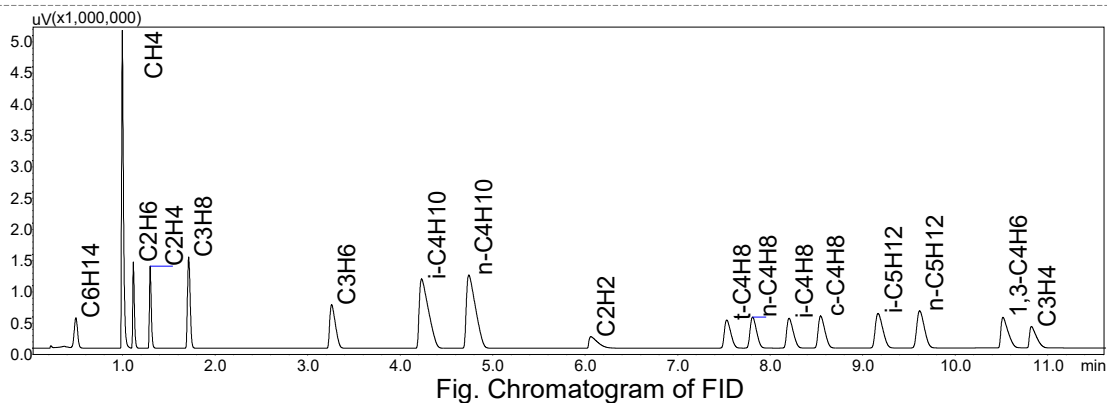


Fig. Chromatogram of FID



Return to
Table

Application Data Sheet

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	H ₂	0.01%	0.5%	TCD-2
3	O ₂	0.1%	0.5%	TCD-2
4	N ₂	0.1%	40.0%	TCD-2
5	CH ₄	50.0%	100%	TCD-2
6	CO ₂	0.1%	30.0%	TCD-1/FID
7	C ₂ H ₆	0.1%	15.0%	TCD-1/FID
8	C ₃ H ₈	0.001%	5.0%	TCD-1/FID
9	i-C ₄ H ₁₀	0.0001%	2.0%	FID
10	n-C ₄ H ₁₀	0.0001%	2.0%	FID
11	i-C ₅ H ₁₂	0.0001%	1.0%	FID
12	n-C ₅ H ₁₂	0.0001%	1.0%	FID
13	C ₆ – C ₈	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

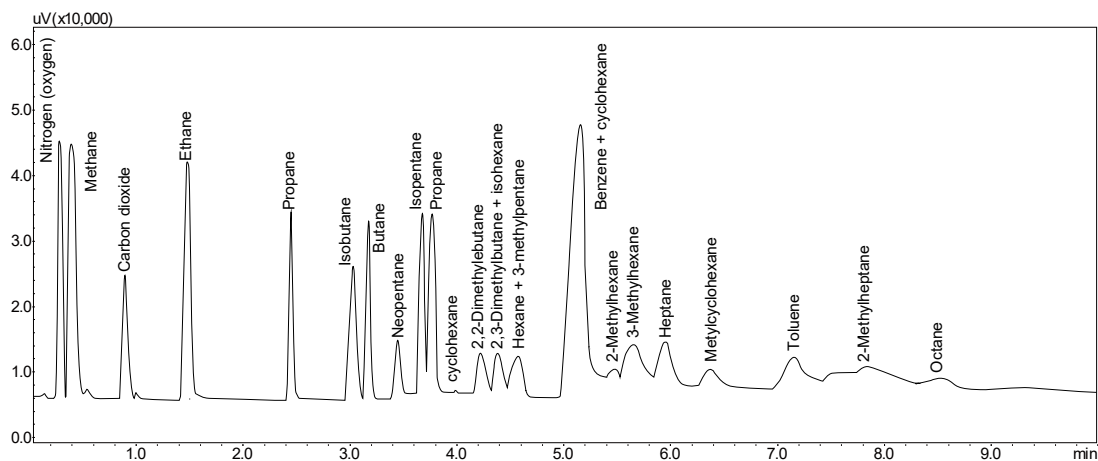


Fig. 1 Chromatogram of TCD

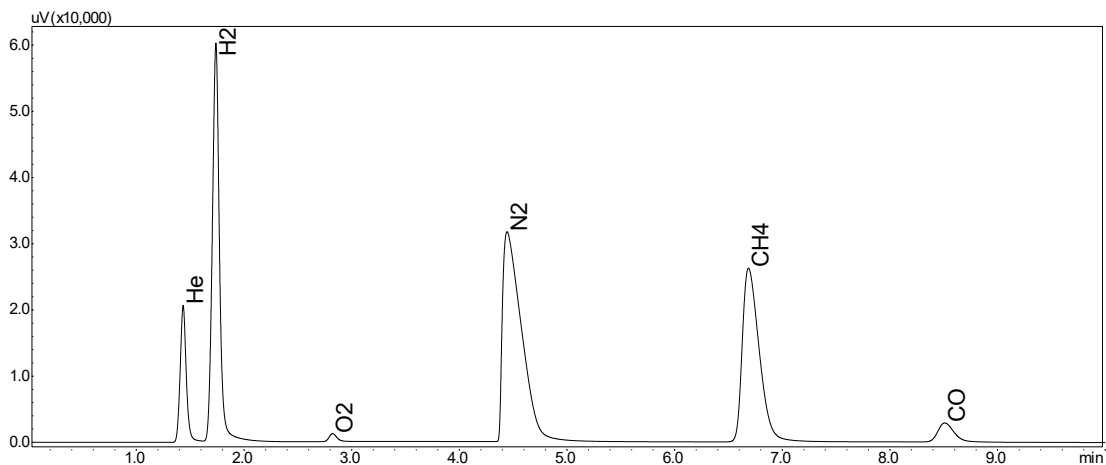


Fig. 2 Chromatogram of TCD

Return to Table

Application Data Sheet

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	N ₂	0.001%	15.0%	TCD-1
2	CH ₄	75.0%	100.0%	TCD-1
3	CO ₂	0.001%	10.0%	TCD-1
4	C ₂ H ₆	0.001%	10.0%	TCD-1
5	C ₃ H ₈	0.001%	3.0%	TCD-1
6	i-C ₄ H ₁₀	0.001%	1.0%	TCD-1
7	n-C ₄ H ₁₀	0.001%	1.0%	TCD-1
8	Neo-C ₅ H ₁₂	0.001%	0.5%	TCD-1
9	i-C ₅ H ₁₂	0.001%	0.5%	TCD-1
10	n-C ₅ H ₁₂	0.001%	0.5%	TCD-1
11	C ₆ +	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

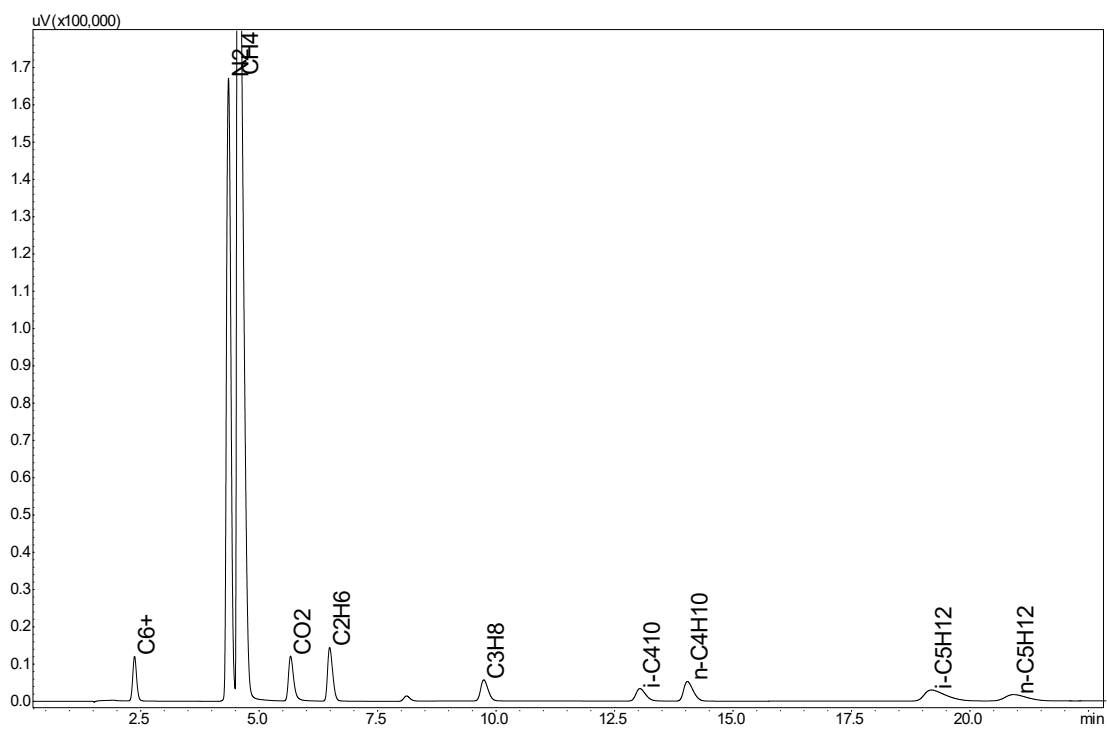


Fig. 2 Chromatogram of TCD

Return to Table



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

«« Return
to main page

Application Data Sheet

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 C₁-C₆

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CH ₄	0.001%	10.0%
2	C ₂ H ₄	0.001%	10.0%
3	C ₂ H ₆	0.001%	10.0%
4	C ₂ H ₂	0.001%	10.0%
5	C ₃ H ₈	0.001%	5.0%
6	C ₃ H ₆	0.001%	5.0%
7	i-C ₄ H ₁₀	0.001%	1.0%
8	n-C ₄ H ₁₀	0.001%	1.0%
9	Propadiene	0.001%	1.0%
10	Other C ₄ and C ₅	0.001%	0.5%
17	C ₃ H ₄	0.001%	0.5%
18	C ₆ H ₁₄	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

Typical Chromatograms

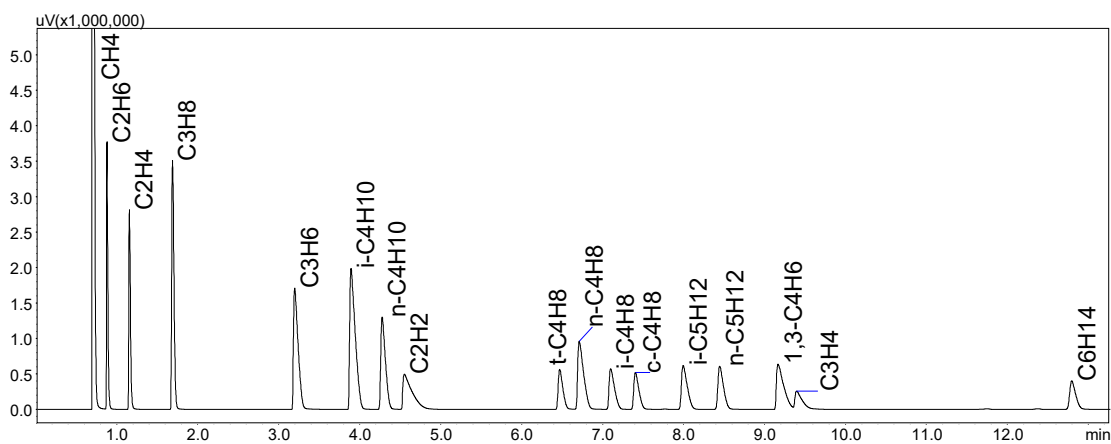


Fig. Chromatogram of FID



Return to Table

Application Data Sheet

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 C₁-C₆

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	CH ₄	0.001%	10.0%	FID
2	C ₂ H ₄	0.001%	10.0%	FID
3	C ₂ H ₆	0.001%	10.0%	FID
4	C ₂ H ₂	0.001%	10.0%	FID
5	C ₃ H ₈	0.001%	5.0%	FID
6	C ₃ H ₆	0.001%	5.0%	FID
7	i-C ₄ H ₁₀	0.001%	1.0%	FID
8	n-C ₄ H ₁₀	0.001%	1.0%	FID
9	Propadiene	0.001%	1.0%	FID
10	Trans-C ₄ H ₈	0.001%	0.5%	FID
11	1-C ₄ H ₈	0.001%	0.5%	FID
12	i-C ₄ H ₈	0.001%	0.5%	FID
13	cis-2-C ₄ H ₈	0.001%	0.5%	FID
14	i-C ₅ H ₁₂	0.001%	0.5%	FID
15	n-C ₅ H ₁₀	0.001%	0.5%	FID
16	1,3-C ₄ H ₆	0.001%	0.5%	FID
17	C ₃ H ₄	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

Typical Chromatograms

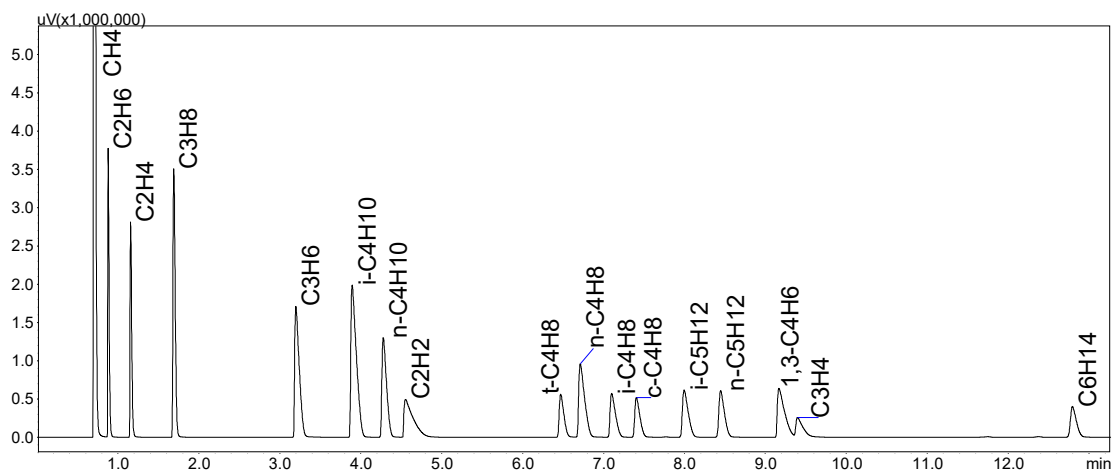


Fig. Chromatogram of FID



Return to
Table

Application Data Sheet

No.41

System Gas Chromatograph

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



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

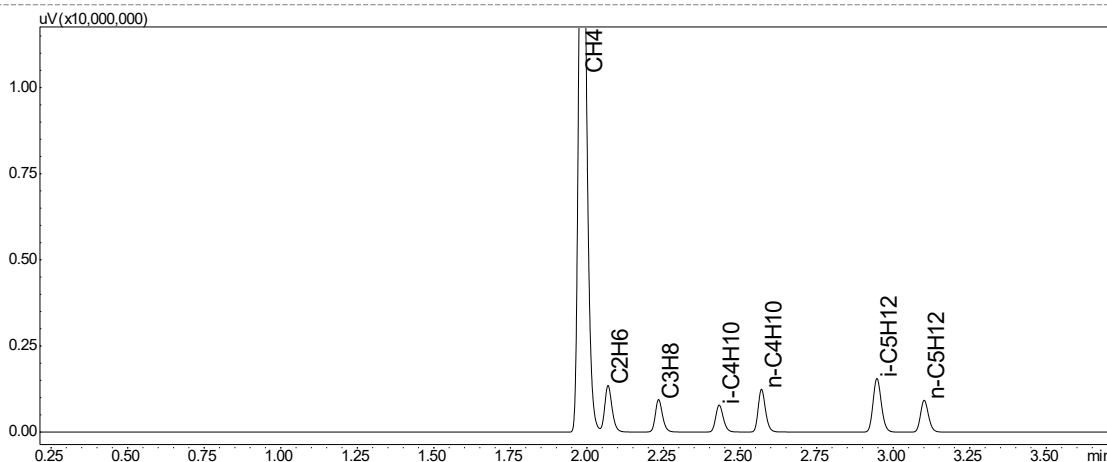


Fig. 1 Chromatogram of FID-1

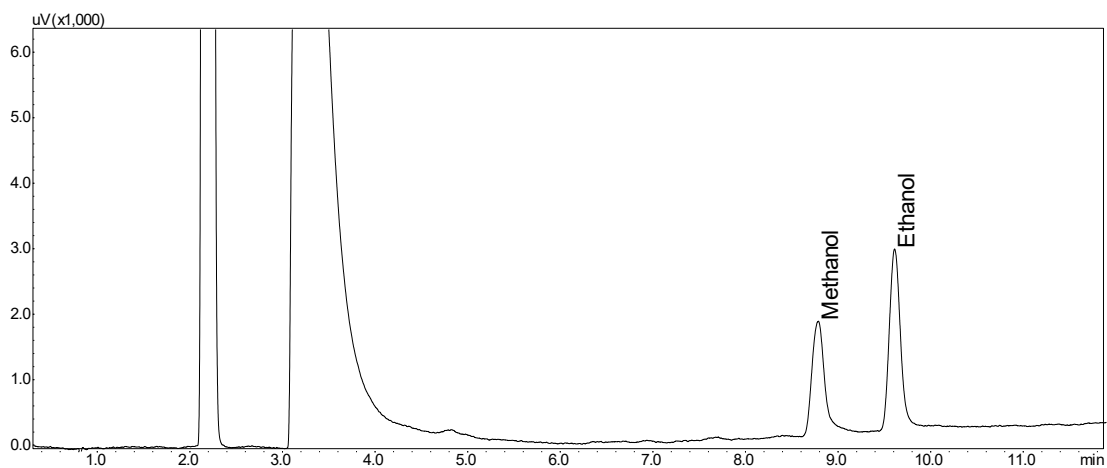


Fig. 2 Chromatogram of FID-2



Return to
Table

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 minutes	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

«« Return to main page

Application Data Sheet

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

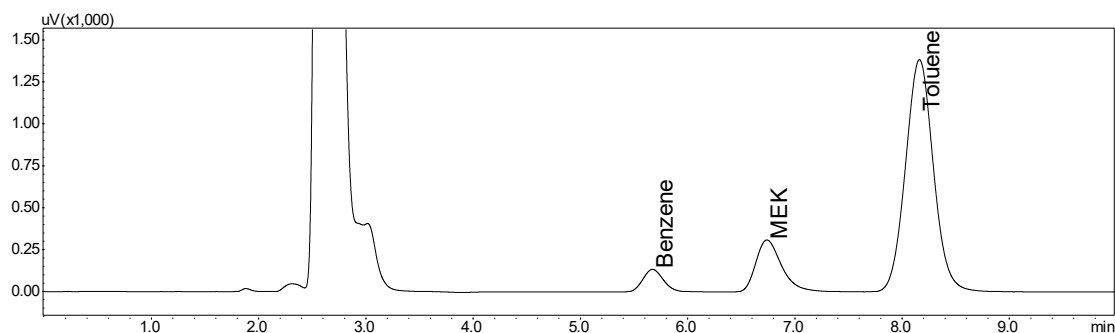


Fig. 1 Chromatogram - ASTM D3606

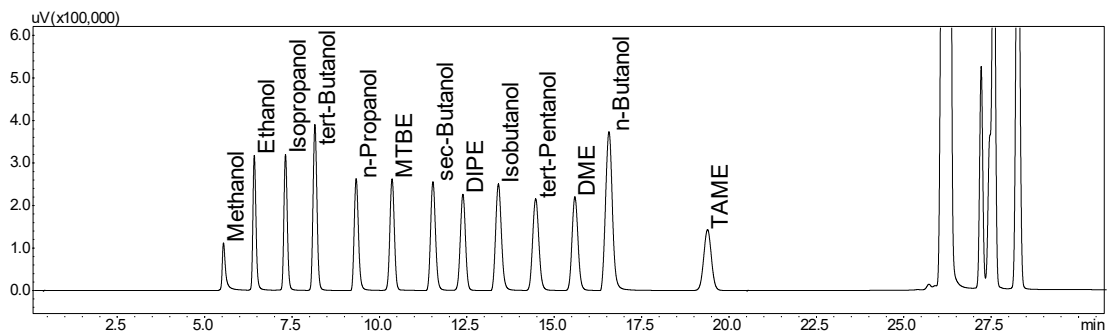


Fig. 2 Chromatogram - ASTM D4815

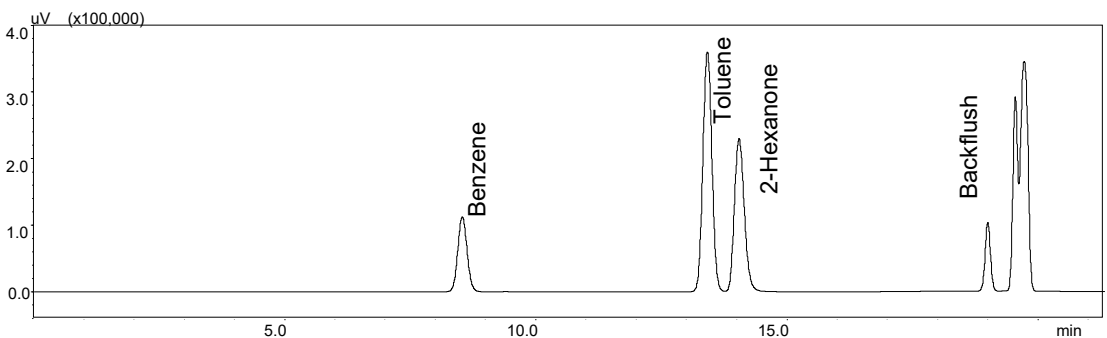


Fig. 3 Chromatogram - ASTM D5580-1

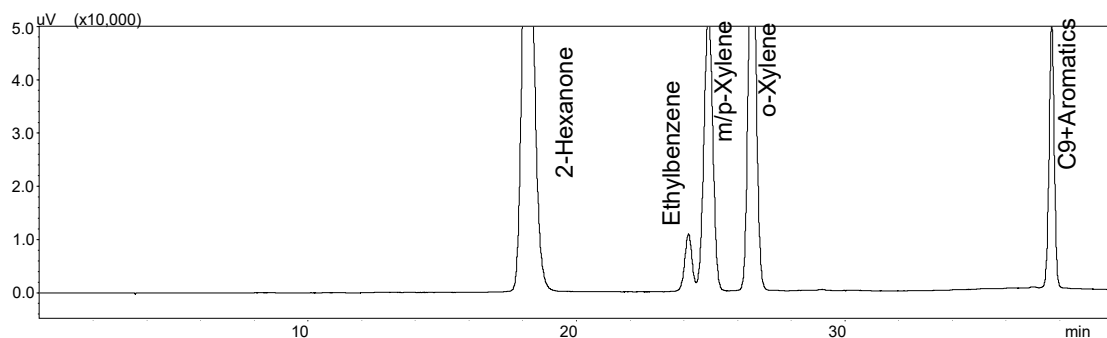


Fig. 4 Chromatogram - ASTM D5580-2

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

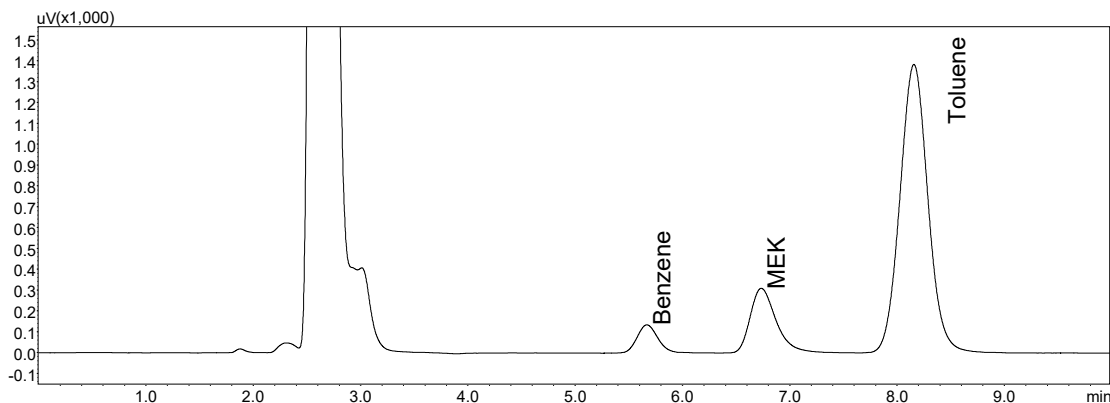


Fig. 1 Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No.23

System Gas Chromatograph

Benzene Toluene Analysis Nexis GC-2030BTA2



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

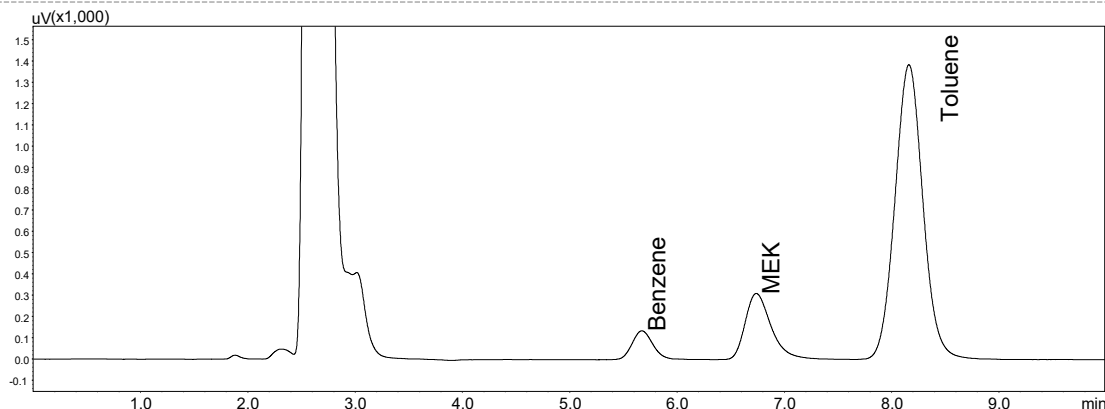


Fig. 1 Chromatogram of FID

First Edition: November, 2017

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

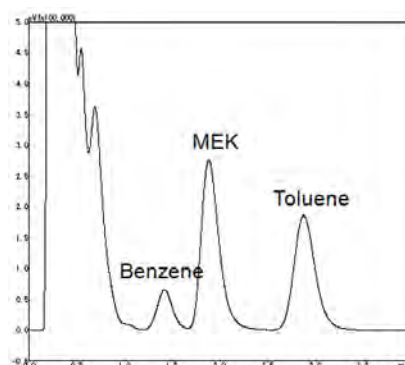


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

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 C₈ and C₉ 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	C ₈ 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

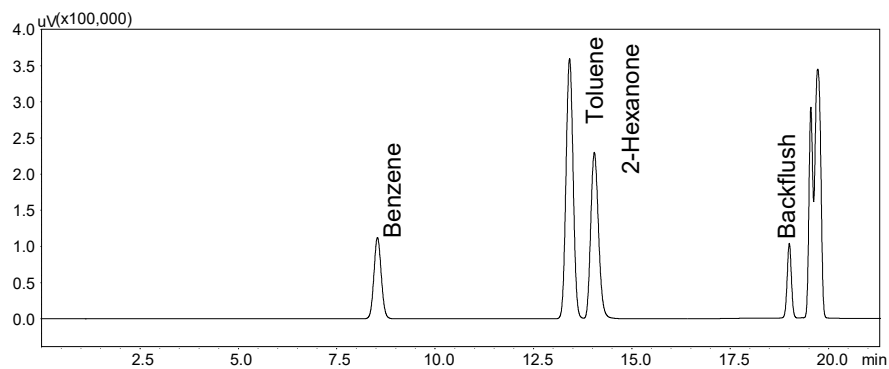


Fig. 1 Chromatogram of FID-1

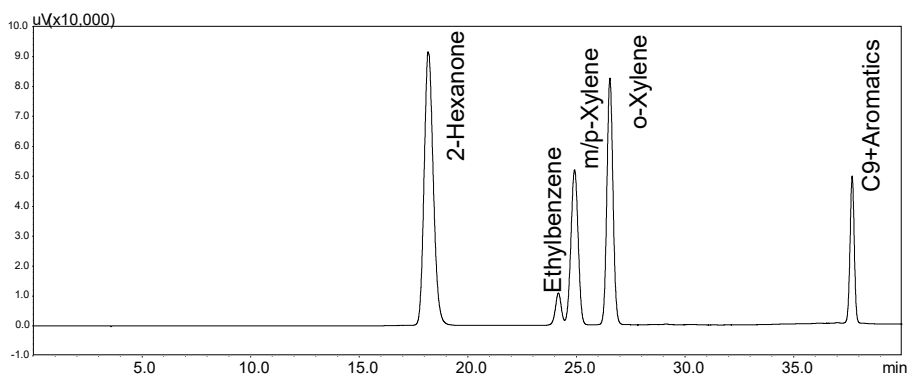


Fig. 2 Chromatogram of FID-1

Return to Table

Application Data Sheet

No. 174

System Gas Chromatograph

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

These methods 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

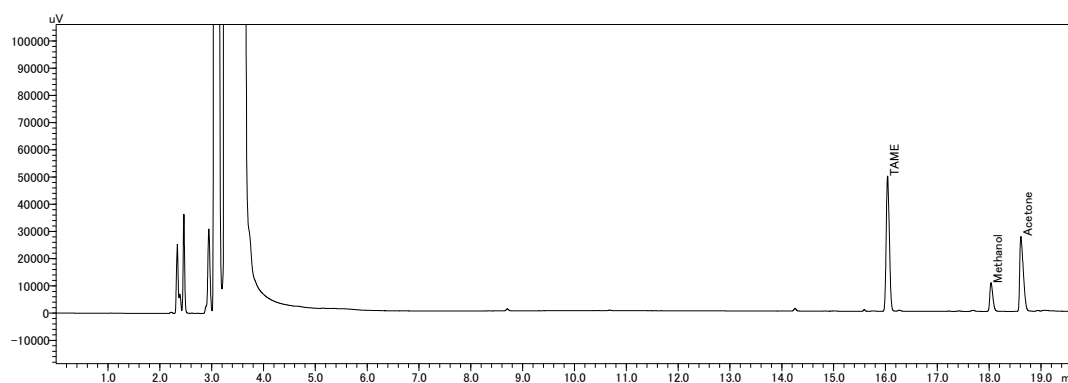


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 188

System Gas Chromatograph

Trace Oxygenated Hydrocarbons in Liquid Hydrocarbon Streams Nexis GC-2030AS3 GC-2014OAS3

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.



Return to Table

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

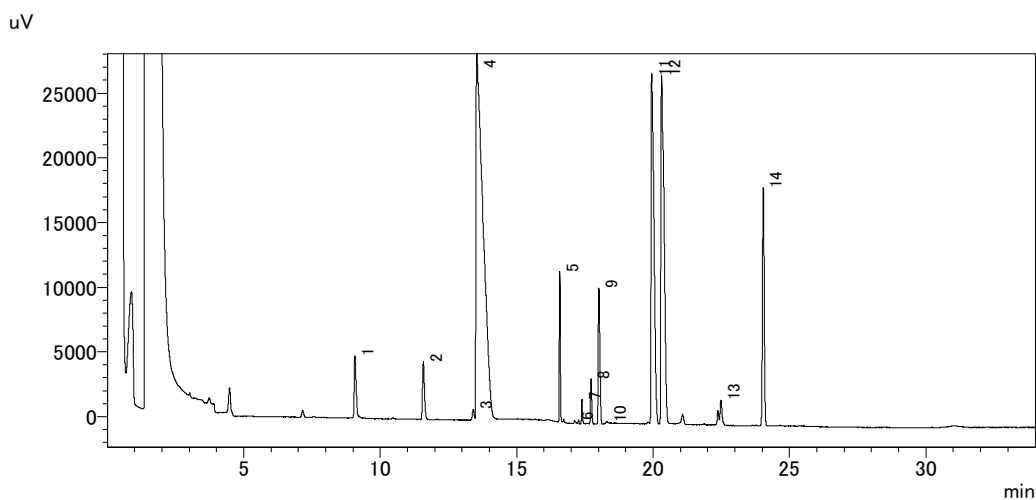


Fig. 1 Chromatogram of FID

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

Application Data Sheet

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 C₁ to C₄ 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

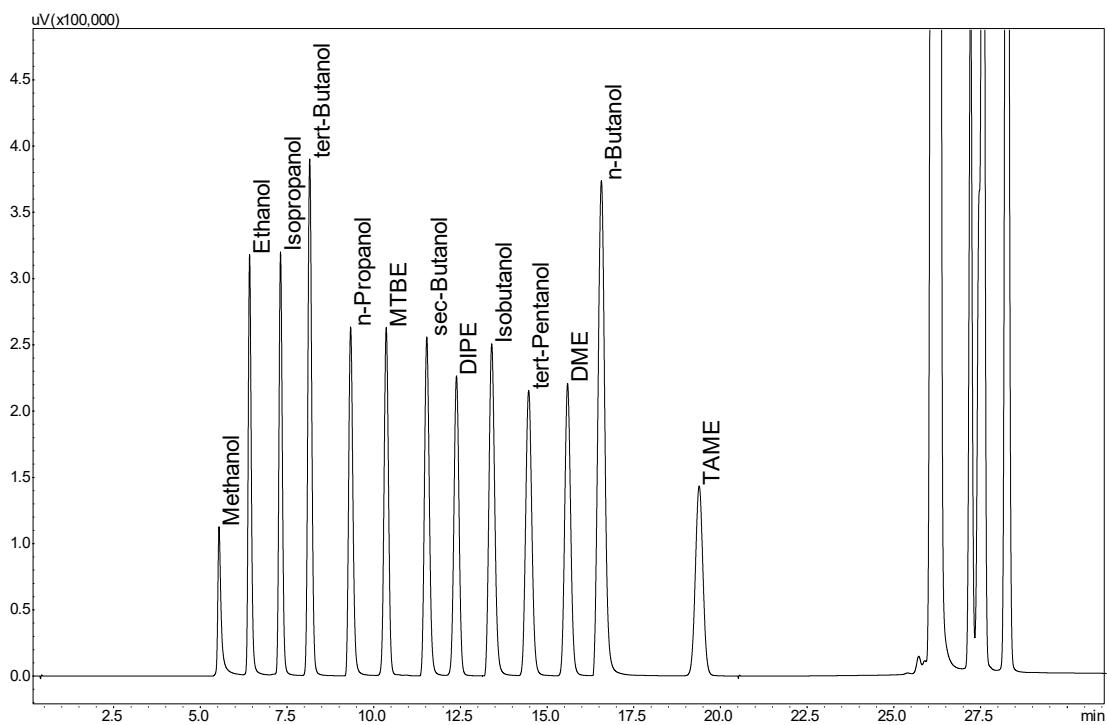


Fig. 1 Chromatogram of FID

Return to Table



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

«« Return
to main page

Application Data Sheet

No. 173

System Gas Chromatograph

Detailed Hydrocarbon Analysis of Naphtha Nexis GC-2030PONA2

A representative sample of the Naphtha is 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 C₁₀⁺.

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	-



Return to
Table

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

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	-



Return to Table

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

Methods met:

ASTM-D5134

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.

System Features

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



Return to Table

Typical Chromatograms

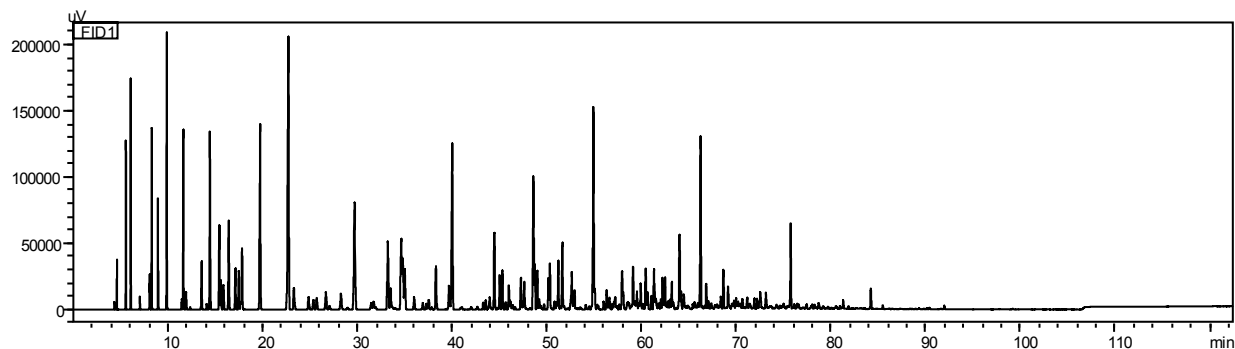


Fig. 1 Chromatogram of FID



Return to Table

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		
Naphthenes:	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.

First Edition: November,2017



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

«« Return
to main page

Application Data Sheet

No. 32

System Gas Chromatograph

TOGAS Analysis System with oil stripper device Nexis GC-2030TOGAS1 GC-2014TOGAS1



Return to Table

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:

H₂, O₂, N₂, CH₄, CO, CO₂, C₂ in transformer oil

Methods met:

ASTM-D3612B

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂	20ppm	10%
2	O ₂	500ppm	1%
3	N ₂	500ppm	10%
4	CH ₄	1ppm	1%
5	CO	2ppm	2%
6	CO ₂	2ppm	2%
7	C ₂ H ₆	1ppm	1%
8	C ₂ H ₄	1ppm	1%
9	C ₂ H ₂	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

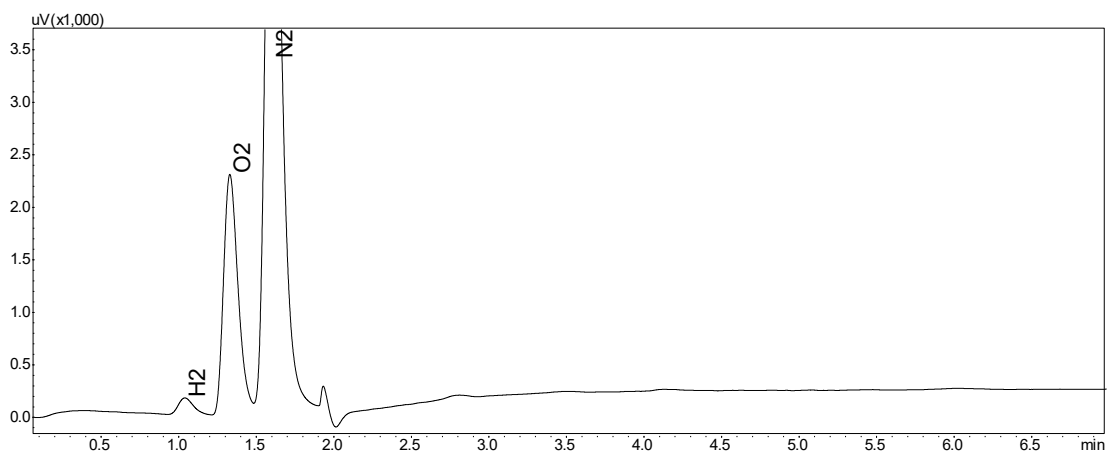


Fig. 1 Chromatogram of TCD

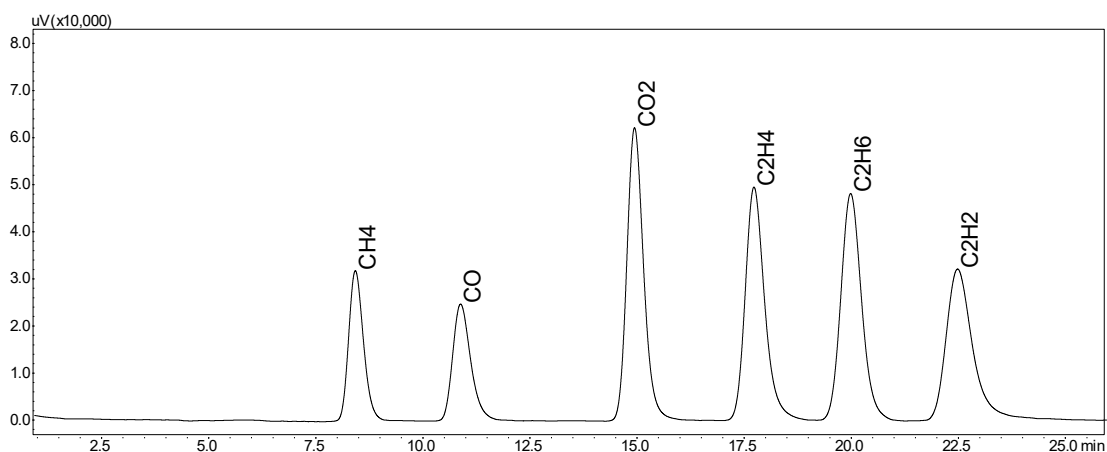


Fig. 2 Chromatogram of FID



Return to
Table

Application Data Sheet

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-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 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:

H₂, O₂, N₂, CH₄, CO, CO₂, C₂ in transformer oil

Methods met:

ASTM-D3612C

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂	2.5ppm	50ppm
2	O ₂	50ppm	500ppm
3	N ₂	50ppm	1%
4	CH ₄	1ppm	1%
5	CO	1ppm	1%
6	CO ₂	1ppm	1%
7	C ₂ H ₆	1ppm	1%
8	C ₂ H ₄	1ppm	1%
9	C ₂ H ₂	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

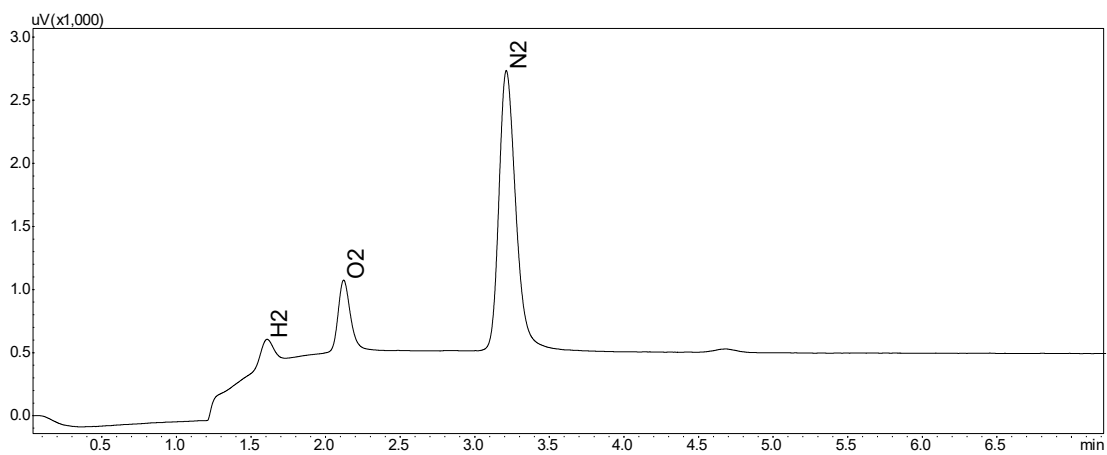


Fig. 1 Chromatogram of TCD

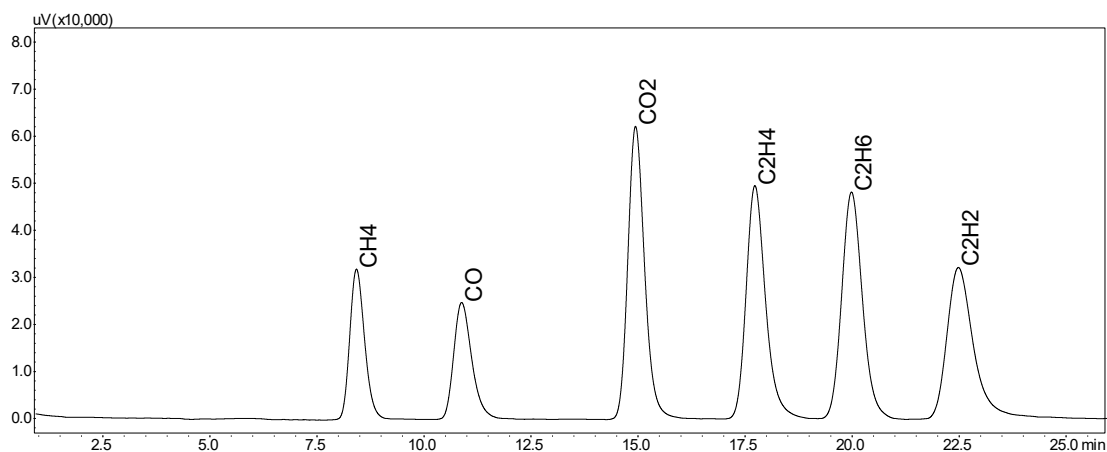


Fig. 2 Chromatogram of FID



Return to Table

Application Data Sheet

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:

H₂, O₂, N₂, CH₄, CO, CO₂, C₂ in transformer oil

Methods met:

ASTM-D3612C

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂	0.1ppm	500ppm
2	O ₂	50.0ppm	50000ppm
3	N ₂	50.0ppm	50000ppm
4	CH ₄	0.1ppm	500ppm
5	CO	0.1ppm	500ppm
6	CO ₂	1.0ppm	1000ppm
7	C ₂ H ₆	0.1ppm	10000ppm
8	C ₂ H ₄	0.1ppm	10000ppm
9	C ₂ H ₂	0.1ppm	10000ppm
10	C ₃ H ₈	0.2ppm	10000ppm
11	C ₃ H ₆	0.2ppm	10000ppm
12	i-C ₄ H ₁₀	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

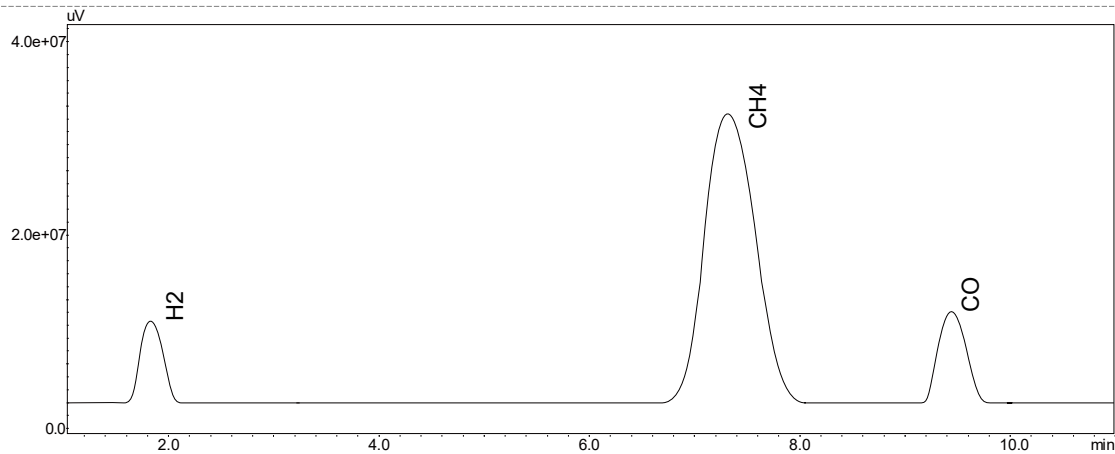


Fig. 1 Chromatogram of PDHID

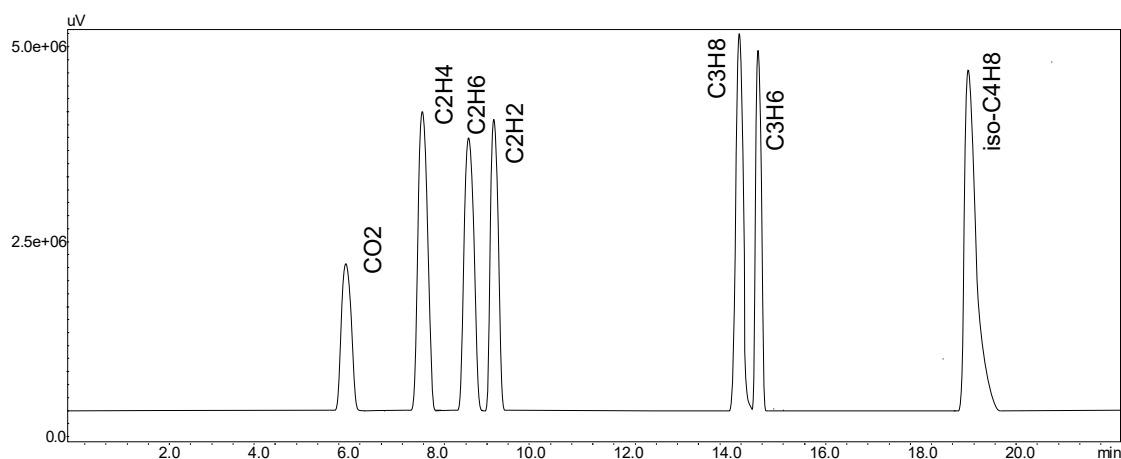


Fig. 2 Chromatogram of FID

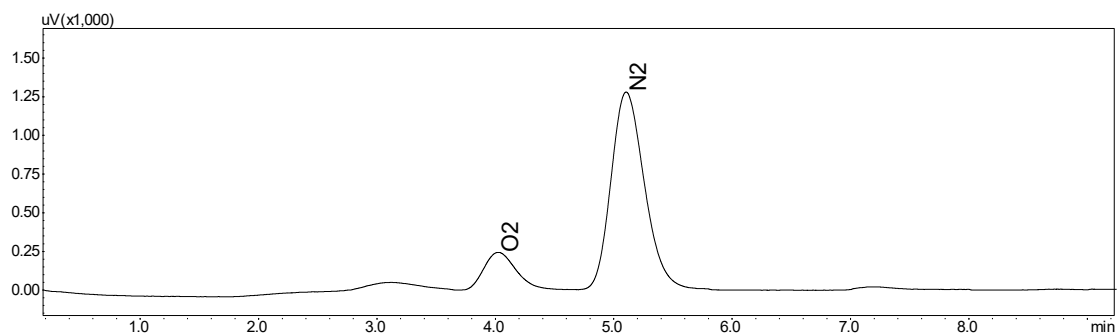


Fig. 3 Chromatogram of TCD



Return to Table

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 (H ₂ >0.1%, Others>50 ppm)	TCD	10 minutes	No. 15
-	H ₂ , O ₂ , N ₂ , CO, CO ₂ , C1, C2 (H ₂ >0.1%, Others>50 ppm)	TCD	12 minutes	No. 16

«« Return
to main page

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 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:

Three valves / six packed columns with Dual TCD detectors

Sample Information:

H₂, O₂, N₂, CO, CO₂, C₁, C₂, C₃

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	He	0.01%	10%
2	H ₂	0.01%	10%
3	O ₂	0.01%	50%
4	N ₂	0.01%	50%
5	CO	0.01%	10%
6	CH ₄	0.01%	90%
7	CO ₂	0.01%	10%
8	C ₂ H ₂	0.01%	40%
9	C ₂ H ₄	0.01%	40%
10	C ₂ H ₆	0.01%	40%
11	C ₃ H ₈	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 H₂

Typical Chromatograms

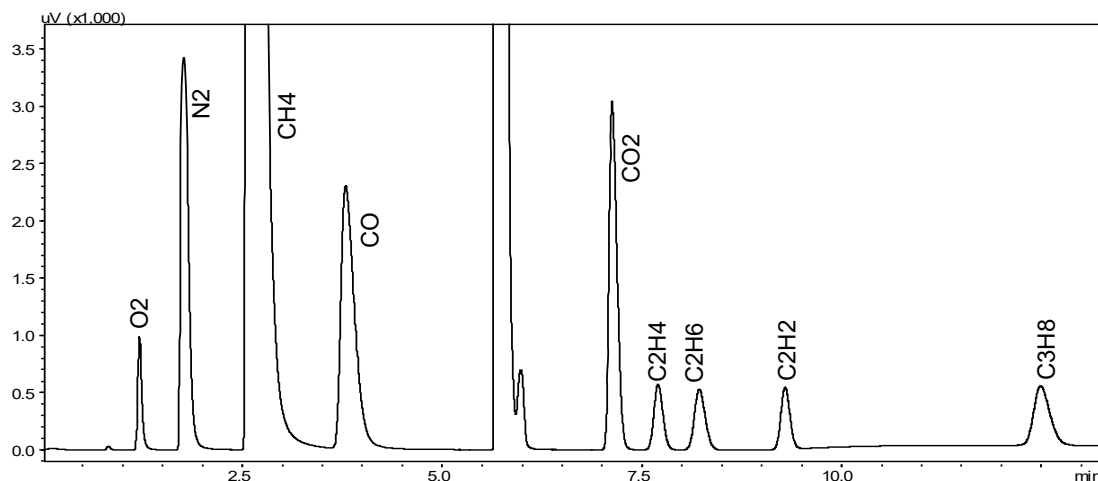


Fig. 1 Chromatogram of TCD-1

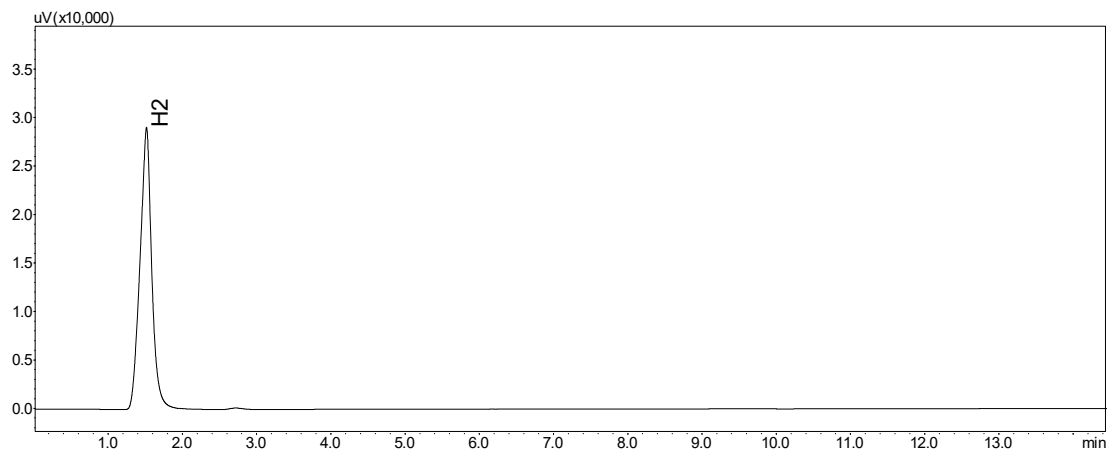


Fig. 2 Chromatogram of TCD-2



Return to
Table

Application Data Sheet

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:

O₂, N₂, CO, CO₂, C₁, C₂, C₃

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	O ₂	0.01%	50%
2	N ₂	0.01%	50%
3	CO	0.01%	10%
4	CH ₄	0.01%	90%
5	CO ₂	0.01%	10%
6	C ₂ H ₂	0.01%	40%
7	C ₂ H ₄	0.01%	40%
8	C ₂ H ₆	0.01%	40%
9	C ₃ H ₈	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

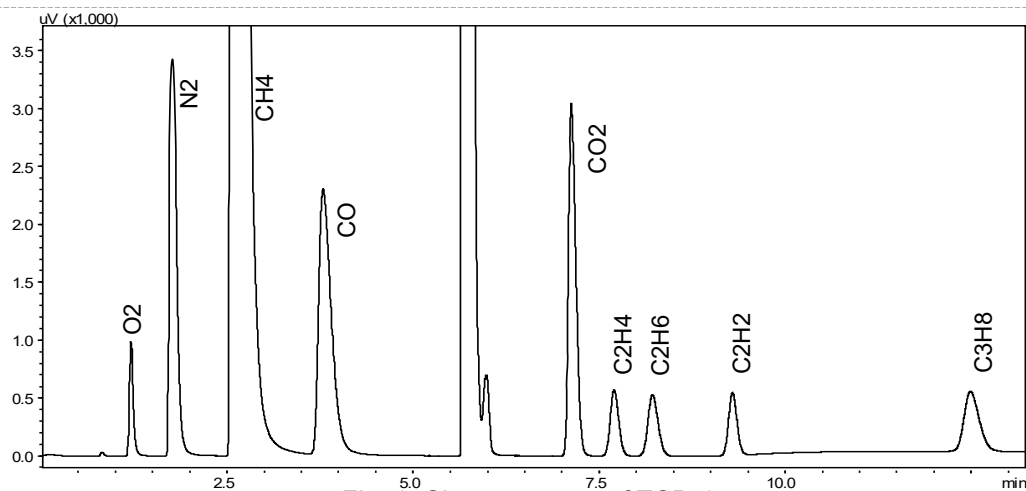


Fig. 1 Chromatogram of TCD-1

First Edition: November, 2017

Application Data Sheet

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:

H₂, O₂, N₂, CO, CO₂, C₁, C₂, C₃

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	He	0.01%	10%
2	H ₂	0.01%	10%
3	O ₂	0.1%	50%
4	N ₂	0.1%	50%
5	CO	0.1%	10%
6	CH ₄	0.1%	90%
7	CO ₂	0.1%	10%
8	C ₂ H ₂	0.1%	40%
9	C ₂ H ₄	0.1%	40%
10	C ₂ H ₆	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 CH₄ and CO

Typical Chromatograms

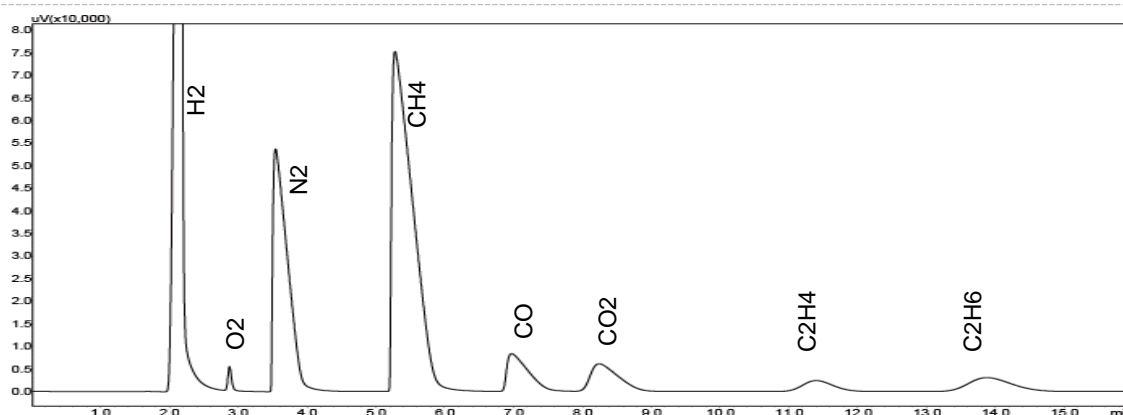


Fig. 1 Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No. 16

System Gas Chromatograph

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



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:

H₂, O₂, N₂, CO, CO₂, C₁, C₂

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	He	0.01%	10%
2	H ₂	0.01%	10%
3	O ₂	0.1%	50%
4	N ₂	0.1%	50%
5	CO	0.1%	10%
6	CH ₄	0.1%	90%
7	CO ₂	0.1%	10%
8	C ₂ H ₂	0.1%	40%
9	C ₂ H ₄	0.1%	40%
10	C ₂ H ₆	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 CH₄ and CO
- Calorific value software is available
- Good separation between CH₄ and CO

Typical Chromatograms

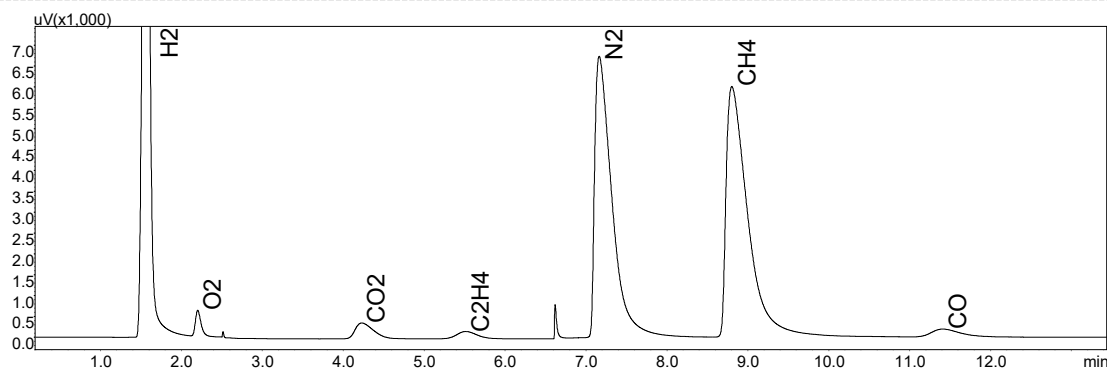


Fig. 1 Chromatogram of TCD

First Edition: November, 2017

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 ₂ S, COS, SO ₂ , mercaptans	PFPD	18 minutes	No. 9
ASTM-D6228	H ₂ S, COS, SO ₂ , mercaptans	PFPD	18 minutes	No. 10
ASTM-D6228	H ₂ S, COS, SO ₂ , mercaptans, aromatic sulfur compounds and sulfides	PFPD	18, 40 minutes	No. 11
ASTM-D6228	H ₂ S, 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 ₂ S, COS	FPD	20 minutes	No. 68
-	H ₂ S, SO ₂	TCD	8 minutes	No. 73

«« Return
to main page

Application Data Sheet

No.9

System Gas Chromatograph

Sulfur Analyzer Nexis GC-2030PFPD1 GC-2014PFPD1

Return to
Table

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 H₂S, COS, SO₂, mercaptans, aromatic sulfur compounds and sulfides.

Methods met:

ASTM-D6228

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂ S	0.05ppmV	100ppmV
2	COS	0.05ppmV	100ppmV
3	MeSH	0.05ppmV	100ppmV
4	EtSH	0.05ppmV	100ppmV
5	DMS	0.05ppmV	100ppmV
6	CS ₂	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

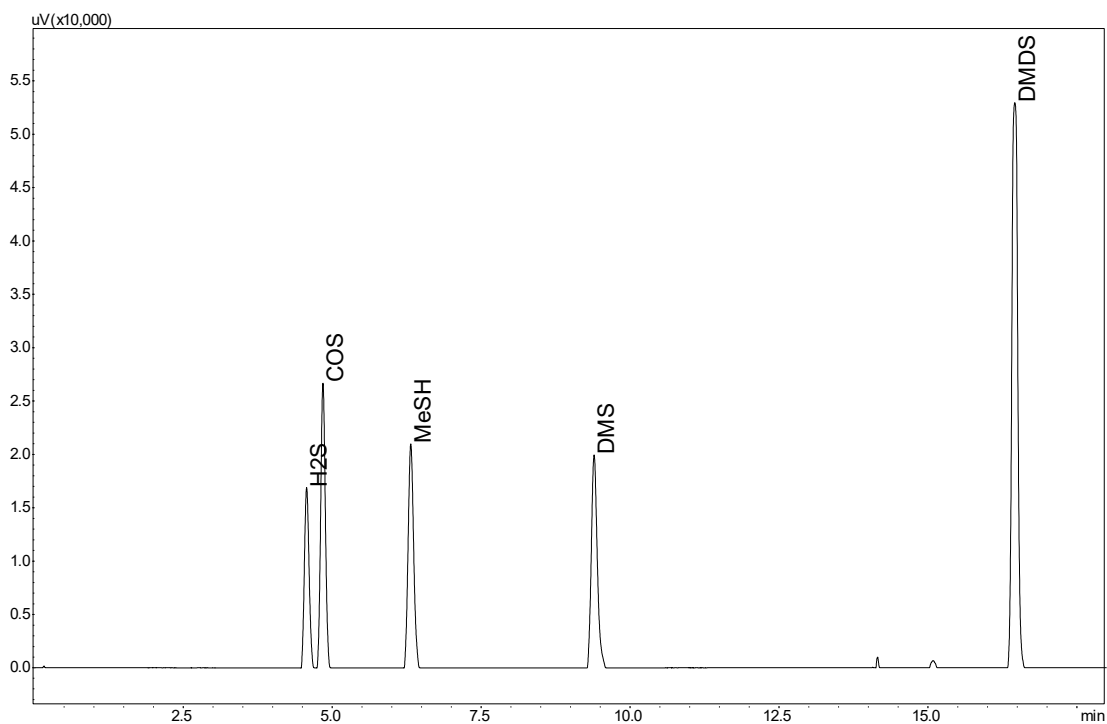


Fig. 1 Chromatogram of PFPD

Return to Table

Application Data Sheet

No. 10

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 H₂S, COS, SO₂, mercaptans, aromatic sulfur compounds and sulfides

Methods met:

ASTM-D6228

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂ S	0.05ppmV	100ppmV
2	COS	0.05ppmV	100ppmV
3	MeSH	0.05ppmV	100ppmV
4	EtSH	0.05ppmV	100ppmV
5	DMS	0.05ppmV	100ppmV
6	CS ₂	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

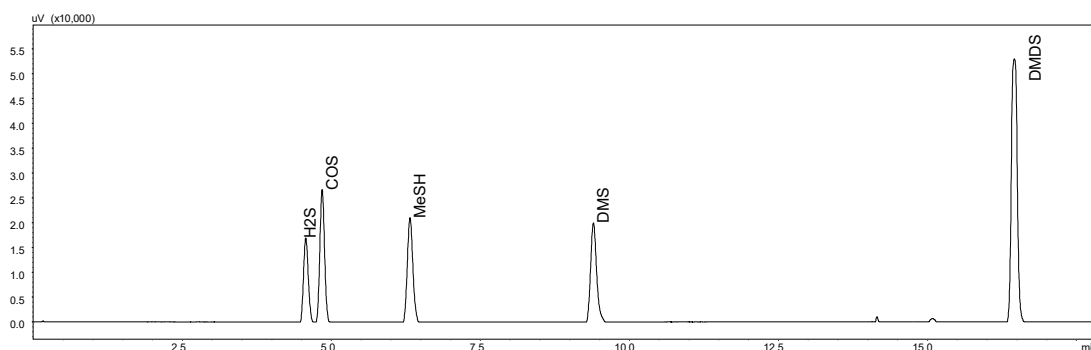


Fig. 1 Chromatogram of PFPD

First Edition: November, 2017

Application Data Sheet

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 H₂S, COS, SO₂, 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	H ₂ S	0.05ppmV	100ppmV
2	COS	0.05ppmV	100ppmV
3	MeSH	0.05ppmV	100ppmV
4	EtSH	0.05ppmV	100ppmV
5	DMS	0.05ppmV	100ppmV
6	CS ₂	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

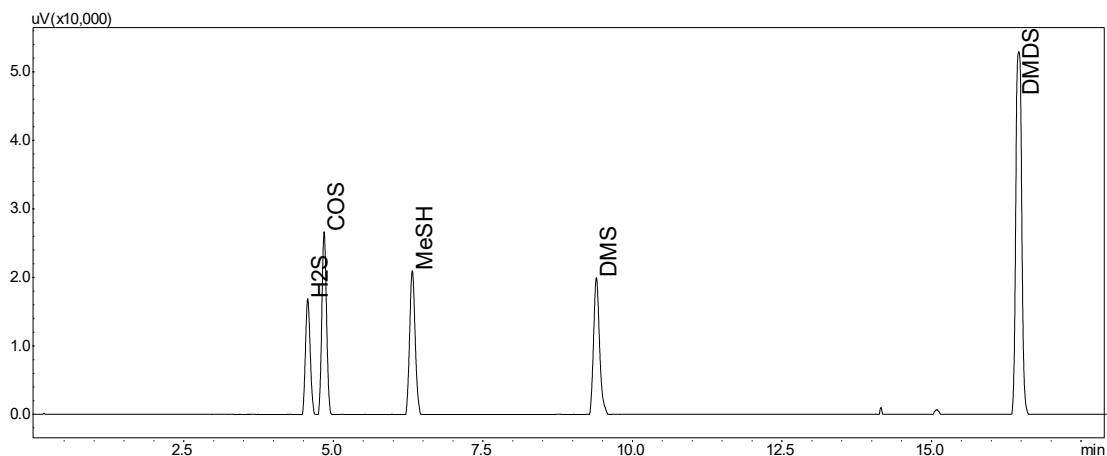


Fig. 1 Chromatogram of Gas-Pro Column

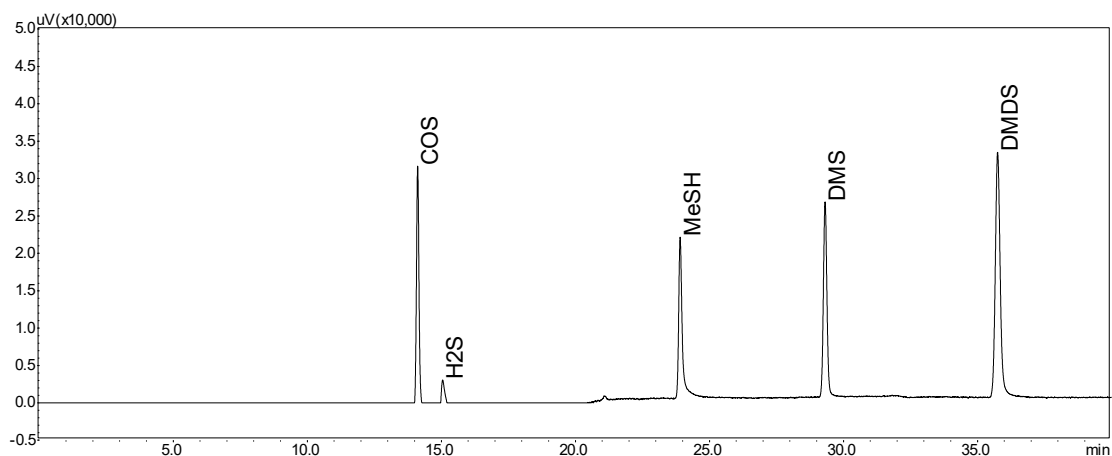


Fig. 2 Chromatogram of Rtx-1 Column



Return to Table

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 H₂S, COS, mercaptans, aromatic sulfur compounds and sulfides.

Methods met:

ASTM-D6228

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	H ₂ S	0.1ppmV	100ppmV
2	COS	0.1ppmV	100ppmV
3	MeSH	0.1ppmV	100ppmV
4	EtSH	0.1ppmV	100ppmV
5	DMS	0.1ppmV	100ppmV
6	CS ₂	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

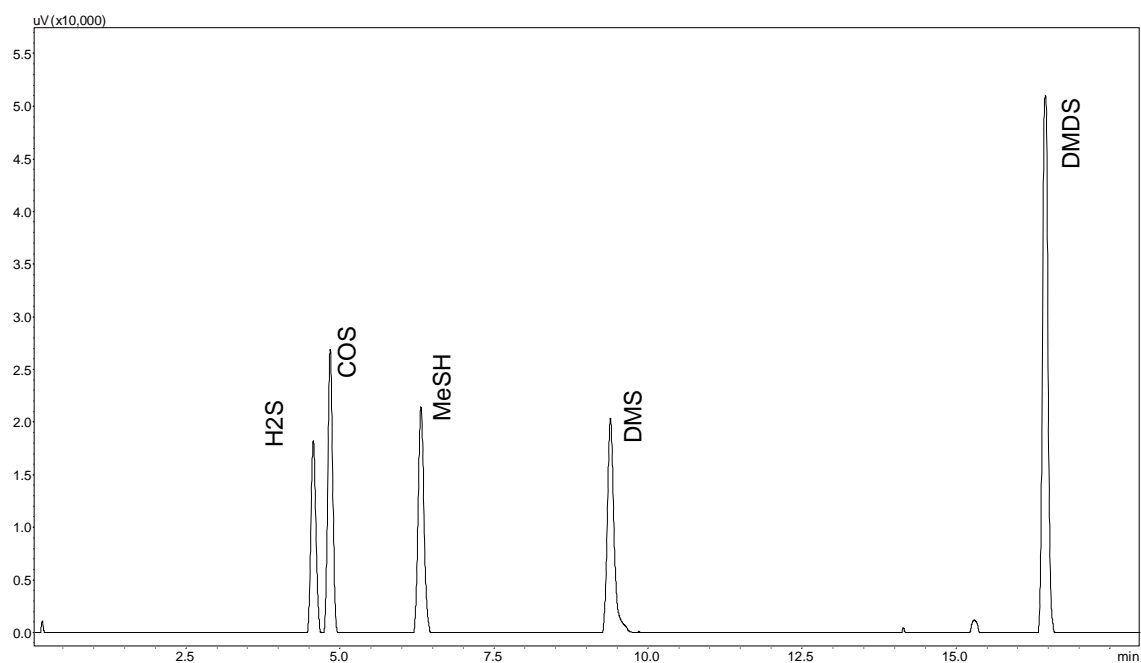


Fig. 1 Chromatogram of FPD

Return to Table

Application Data Sheet

No. 172

System Gas Chromatograph

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



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

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.

Methods met:

ASTM-D4735

System Features

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

Typical Chromatograms

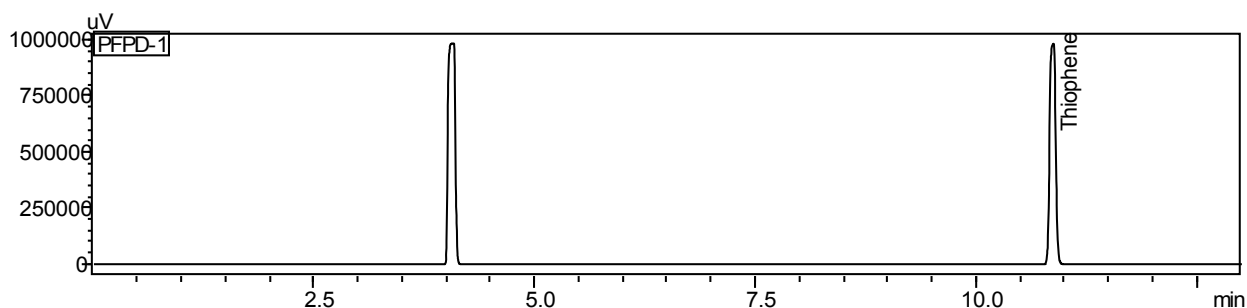


Fig. 1 Chromatogram of PFPD

Application Data Sheet

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:

H₂S, COS

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂ S	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

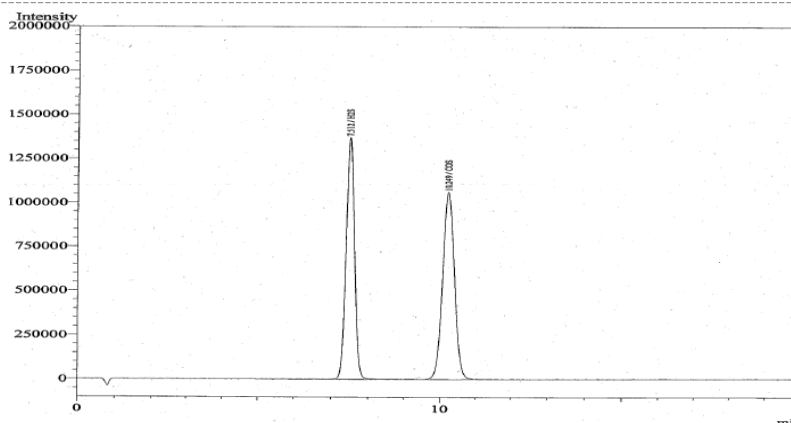


Fig. Chromatogram of FPD

First Edition: November, 2017

Application Data Sheet

No. 73

System Gas Chromatograph

H₂S and SO₂ in C₂, C₃, and C₄ Analysis System Nexis GC-2030SUL2 GC-2014SUL2



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:

H₂S, SO₂

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂ S	0.01%	30%	TCD
2	SO ₂	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

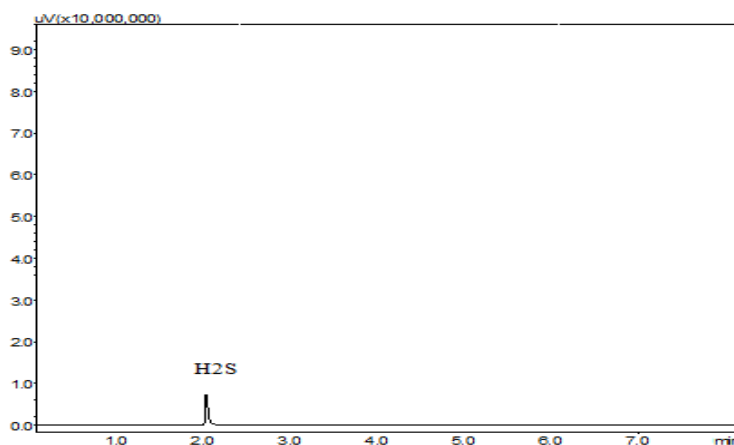


Fig. Chromatogram of TCD

First Edition: November, 2017

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 ₂ O > 50 ppb	ECD	9 minutes	No. 39
N ₂ O > 50 ppb, O ₂ , N ₂ , CO, CO ₂ , CH ₄ > 0.01 %	Dual TCD, FID, ECD	11 minutes	No. 57
N ₂ O > 50 ppb, CO, CO ₂ , CH ₄ > 0.01 %	FID, ECD	11 minutes	No. 58
N ₂ O > 50 ppb, O ₂ , N ₂ , CO, CO ₂ , CH ₄ > 0.01 %	Dual TCD, ECD	11 minutes	No. 59
N ₂ O > 50 ppb, CO ₂ > 100 ppm, CH ₄ > 1 ppm	Dual TCD, FID, ECD	9 minutes	No. 122

«« Return
to main page

Application Data Sheet

No. 39

System Gas Chromatograph

Nitrous Oxide (N₂O) Released from Soil Analyzer Nexis GC-2030N₂O1 GC-2014N₂O1



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:

N₂O in Greenhouse gases and soil gases

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	N ₂ O	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

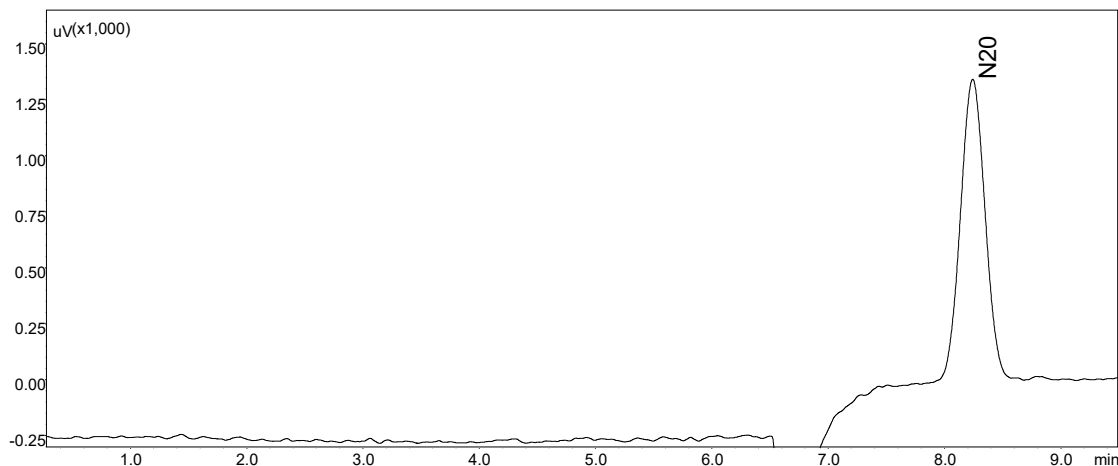


Fig. 1 Chromatogram of ECD

First Edition: November, 2017

Application Data Sheet

No. 57

System Gas Chromatograph

N₂O/CO/CO₂/CH₄ 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 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	N ₂ O	50.00ppb	100.00ppm	ECD
2	CH ₄	1.00ppm	100.00ppm	FID
3	CO	1.00ppm	100.00ppm	MTN+FID
4	CO ₂	1.00ppm	100.00ppm	MTN+FID
5	CH ₄	0.01%	10.00%	TCD
6	CO	0.01%	10.00%	TCD
7	CO ₂	0.01%	10.00%	TCD
8	N ₂	0.01%	20.00%	TCD
9	O ₂	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

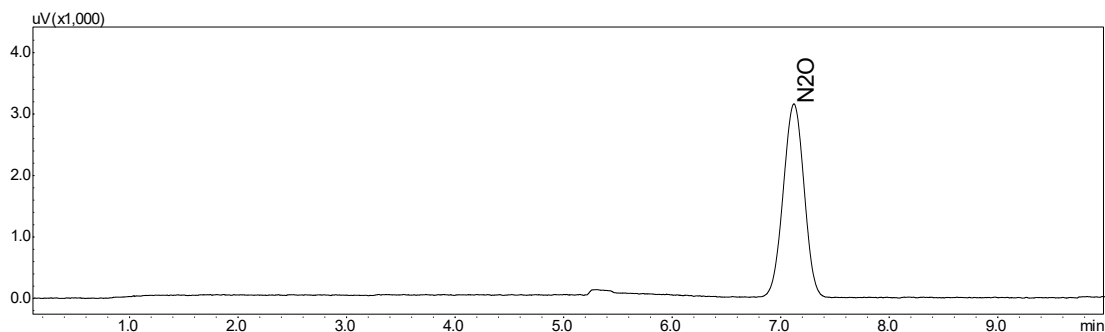


Fig. 1 Chromatogram of ECD

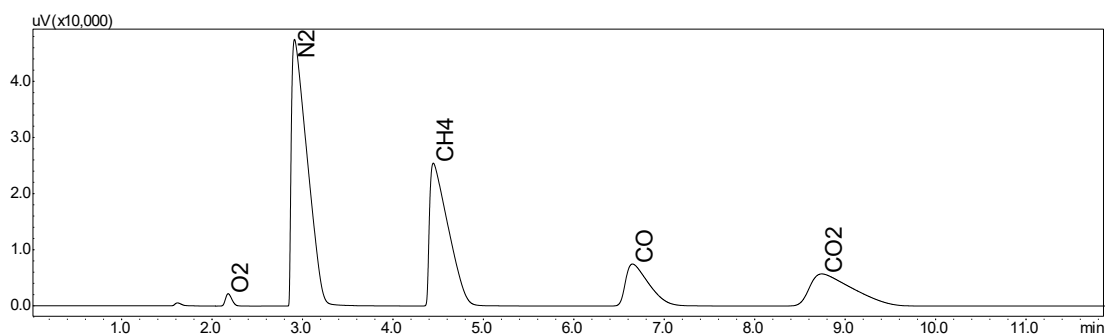


Fig. 2 Chromatogram of TCD

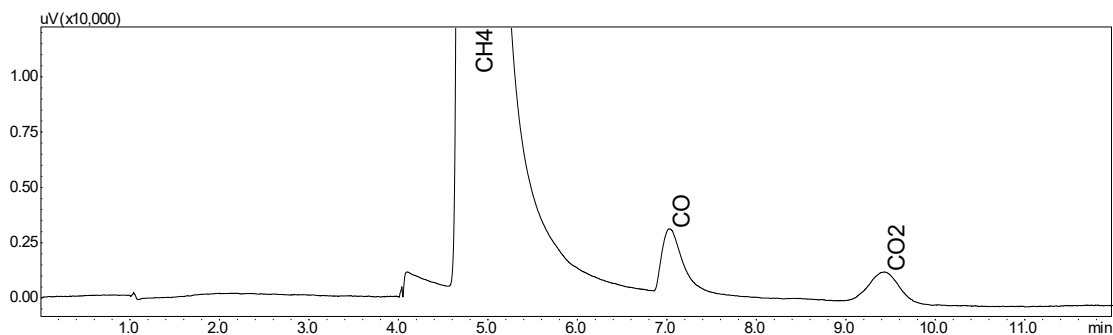


Fig. 3 Chromatogram of FID

First Edition: November, 2017



Return to
Table

Application Data Sheet

No. 58

System Gas Chromatograph

N₂O/CO/CO₂/CH₄ 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	CH ₃ COCH ₃	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

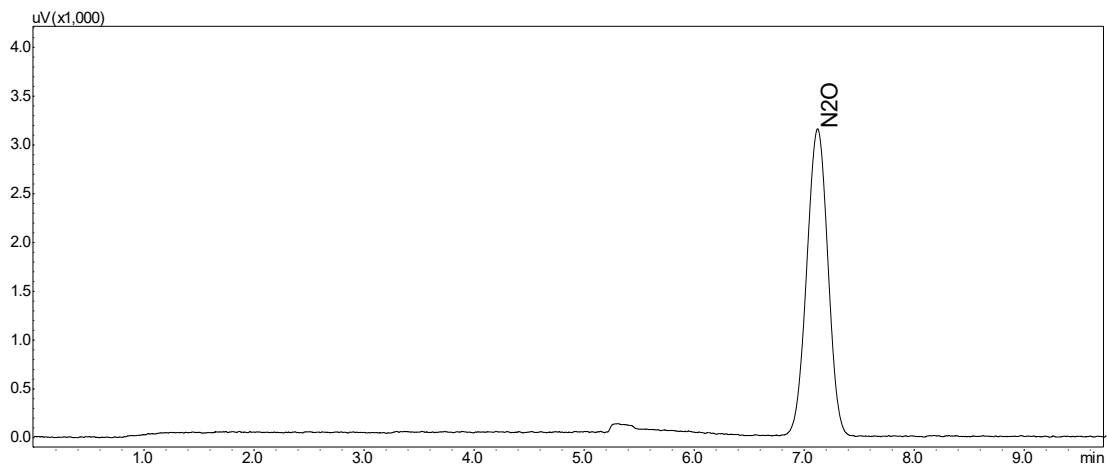


Fig. 1 Chromatogram of ECD

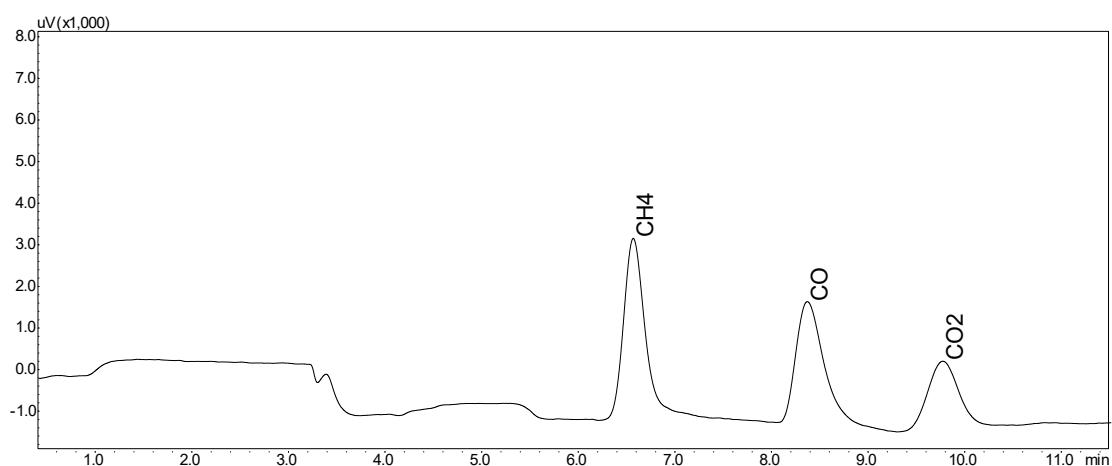


Fig. 2 Chromatogram of FID



Return to
Table

Application Data Sheet

No. 59

System Gas Chromatograph

N₂O/CO/CO₂/CH₄ 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	N ₂ O	50.00ppb	100.00ppm	ECD
2	CH ₄	0.01%	10.00%	TCD
3	CO	0.01%	10.00%	TCD
4	CO ₂	0.01%	10.00%	TCD
5	N ₂	0.01%	20.00%	TCD
6	O ₂	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

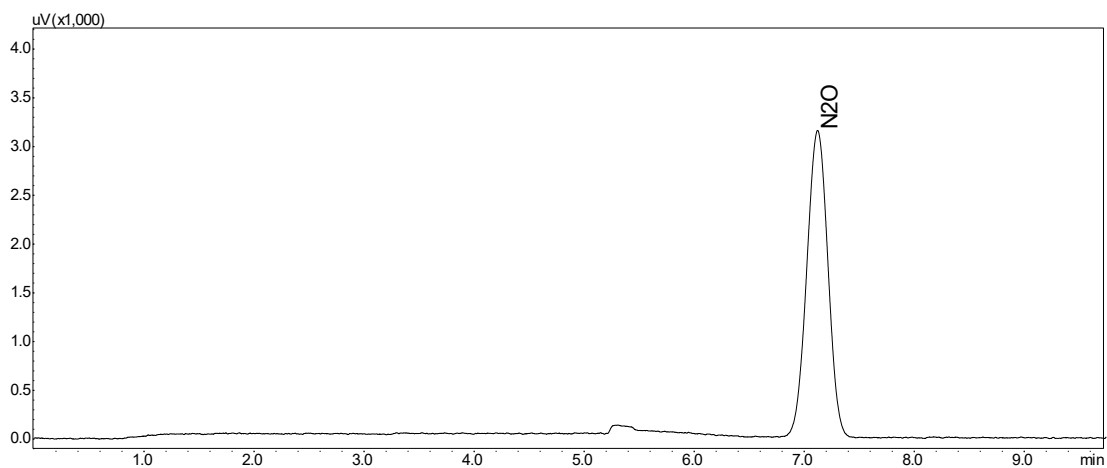


Fig. 1 Chromatogram of ECD

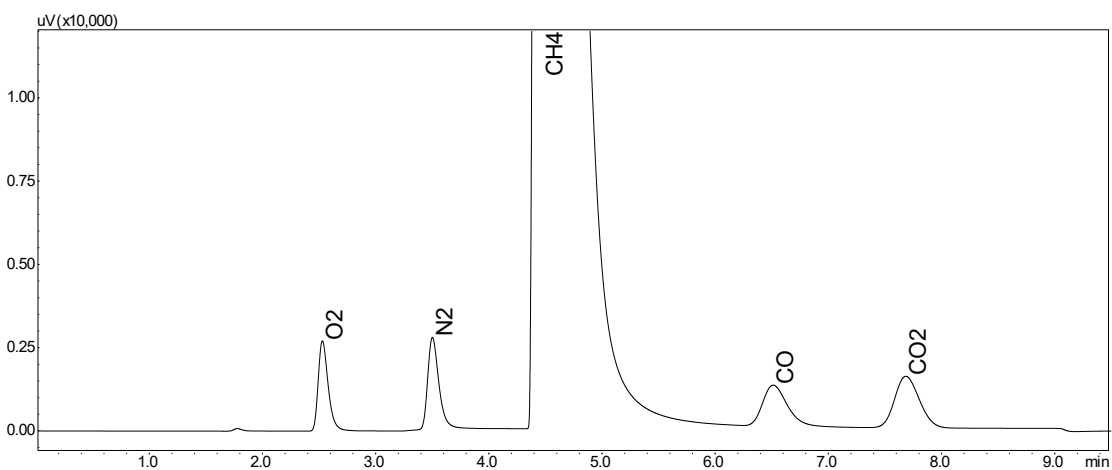


Fig. 2 Chromatogram of TCD



Return to
Table

Application Data Sheet

No. 122

System Gas Chromatograph

Nitrous Oxide (N₂O) Released from Soil Analyzer Nexis GC-2030 N₂OCC1 GC-2014 N₂OCC1

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:

N₂O in greenhouse gases and soil gases

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	N ₂ O	50ppb	170ppm	ECD
2	CH ₄	1ppm	1000ppm	FID
3	CO ₂	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

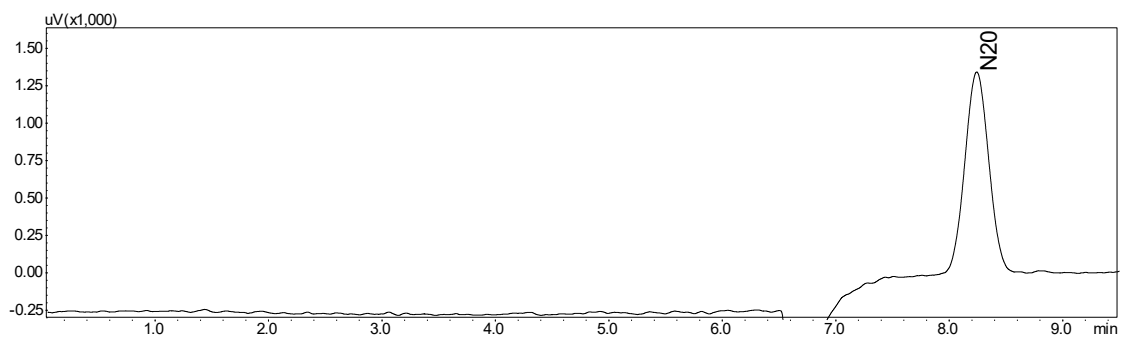


Fig.1 Chromatogram of ECD

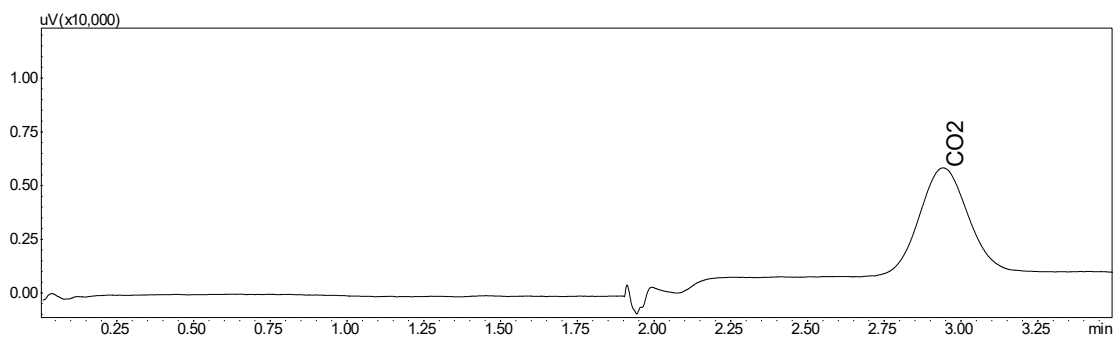


Fig.2 Chromatogram of TCD

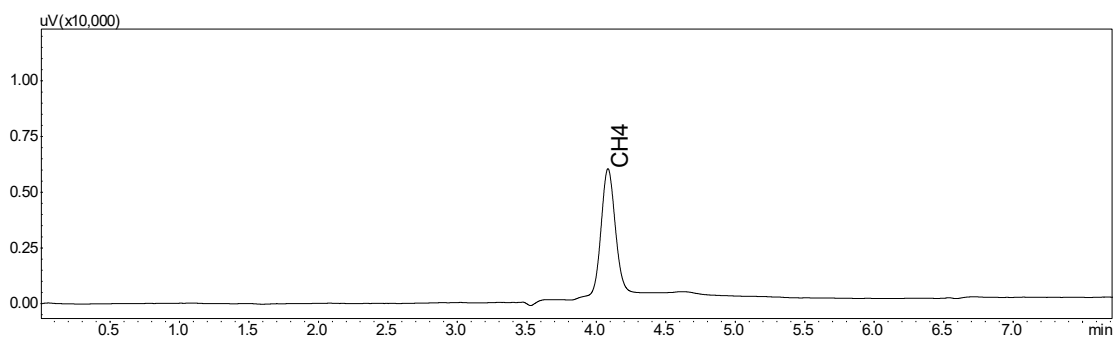


Fig. 3 Chromatogram of FID

Return to Table



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

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 Acetaldehyde 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 ₂ O 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

«« Previous Page

«« Return to main page

Application Data Sheet

No.87

System Gas Chromatograph

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



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:

CH₃COCH₃, Propylene aldehyde

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	CH ₃ COCH ₃	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

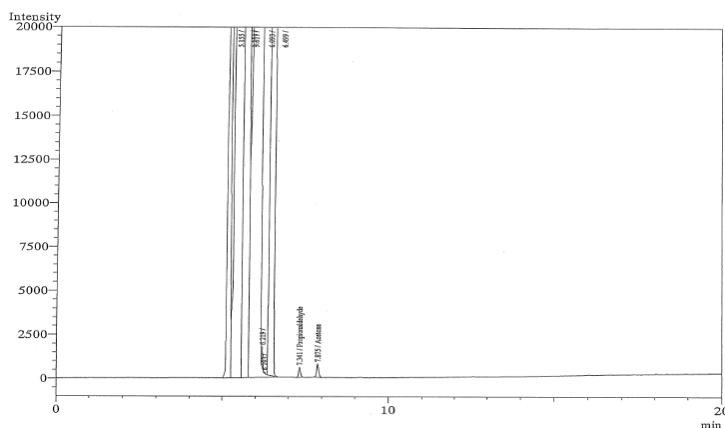


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

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

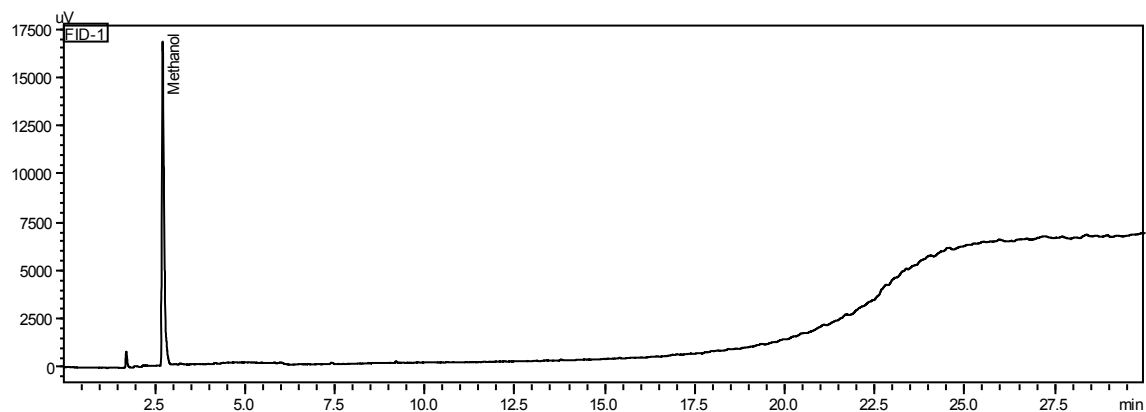


Fig. 1 Chromatogram of FID

First Edition: November 2017

Application Data Sheet

No. 74

System Gas Chromatograph

Ammonia at Sulfur Recovery Unit in % Level Analysis System

Nexis GC-2030NH₃ GC-2014NH₃



Return to Table

This instrument is applied 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:

NH₃

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Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	NH ₃	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

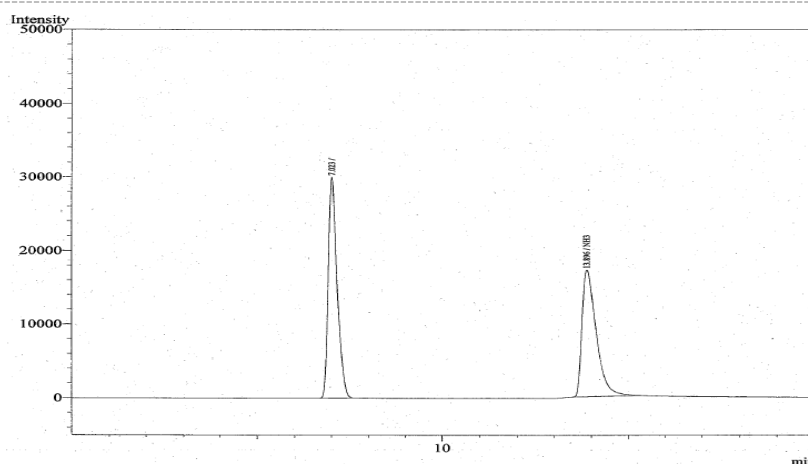


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No.37

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

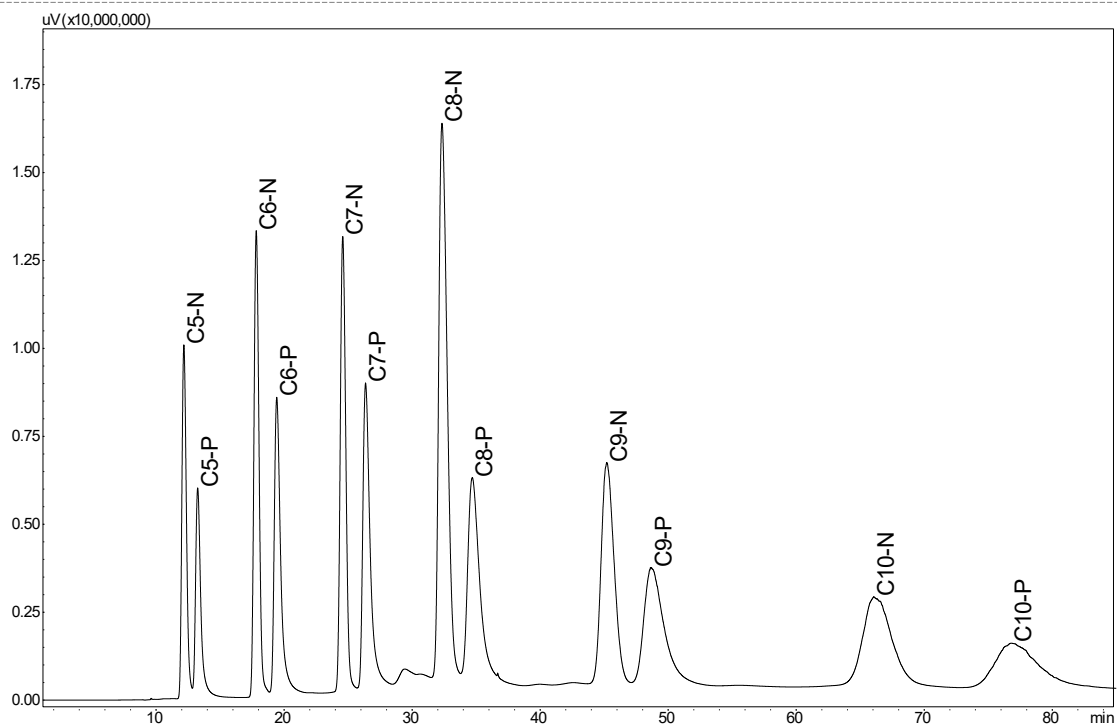


Fig. 1 Chromatogram of FID

Return to Table

Application Data Sheet

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 °C 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

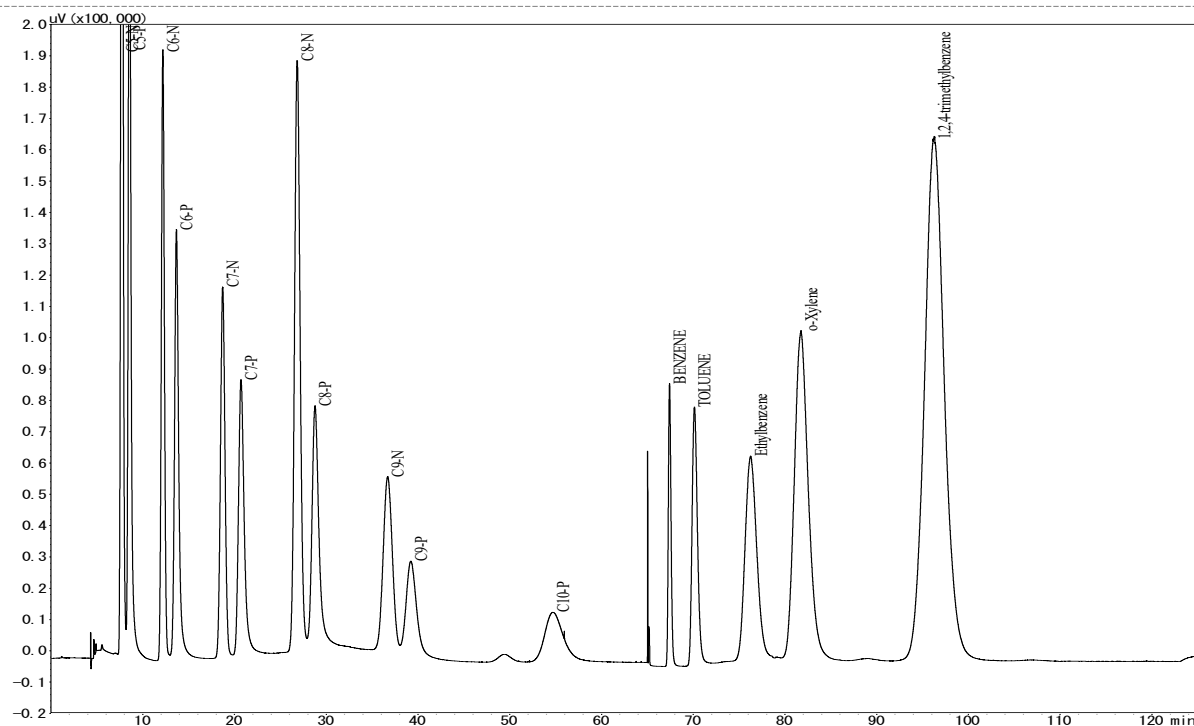


Fig. 1 Chromatogram of FID

Return to Table

Application Data Sheet

No. 176

System Gas Chromatograph

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

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

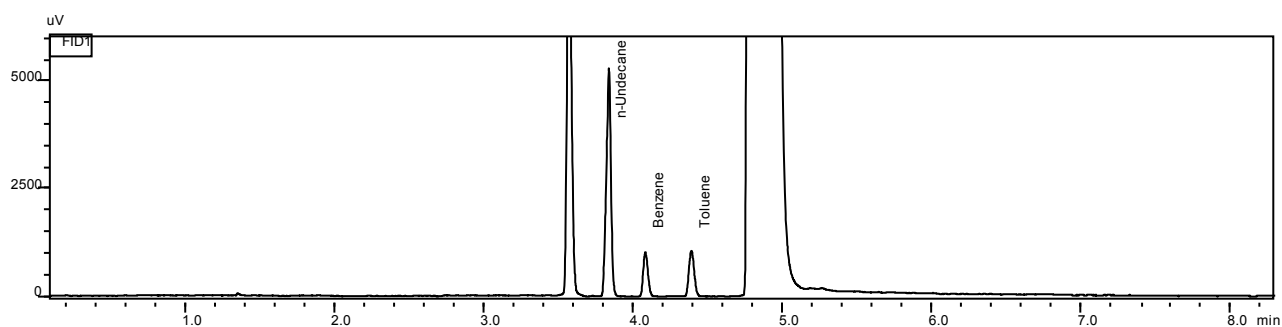


Fig. 1 Chromatogram of FID

Application Data Sheet

No. 183

System Gas Chromatograph

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

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.



Return to Table

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.



Return to Table

System Features

- Single FID channel
- Good repeatability

Typical Chromatograms

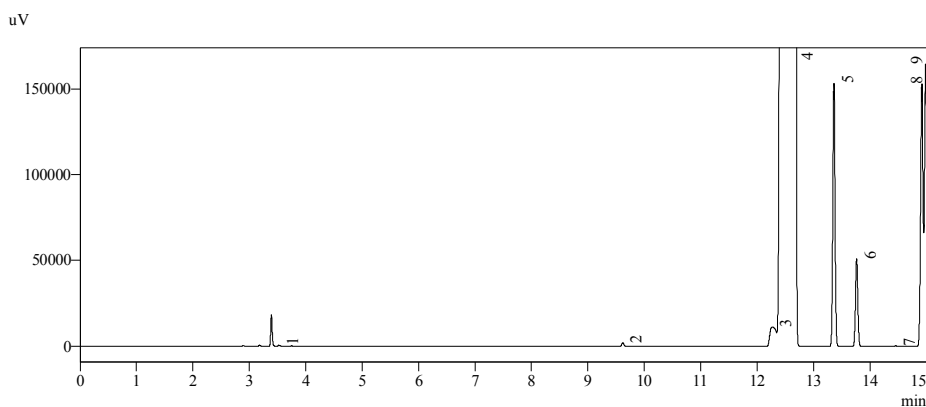


Fig. 1 Chromatogram of FID – 1 of 3

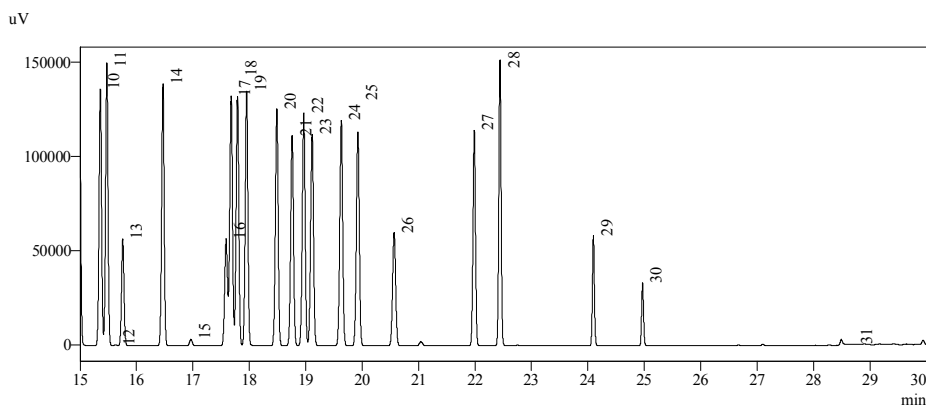


Fig. 2 Chromatogram of FID – 2 of 3

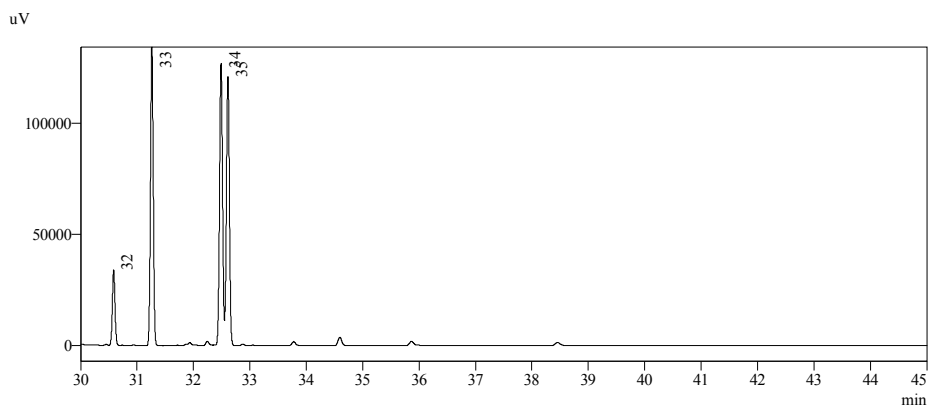


Fig. 3 Chromatogram of FID – 3 of 3



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

Application Data Sheet

No. 184

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

Concentration Range:

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

Methods met:

UOP-798

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

System Features

- Single FID channel
- Good repeatability

Typical Chromatograms

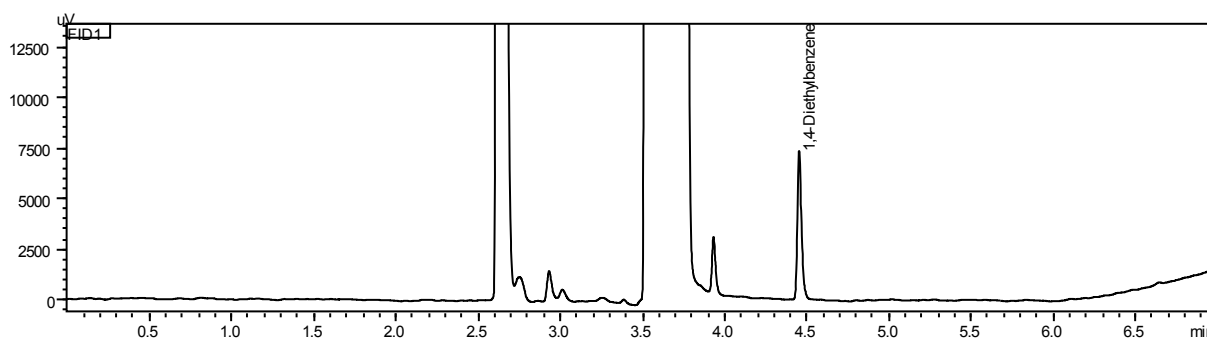


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No.95

System Gas Chromatograph

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



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

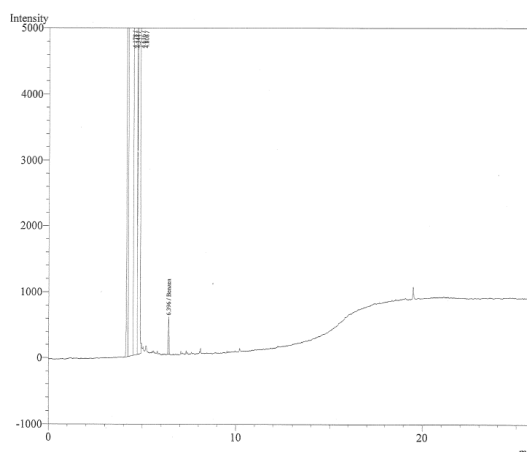


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 171

System Gas Chromatograph

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



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

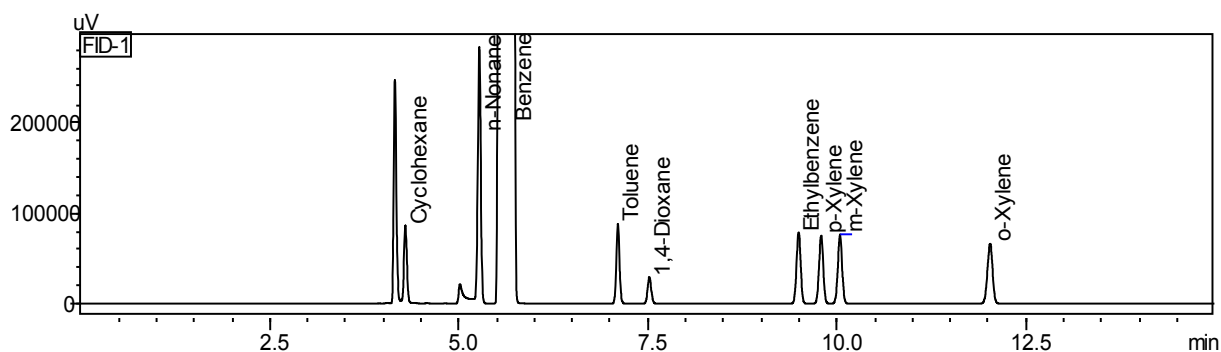


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 175

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.



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

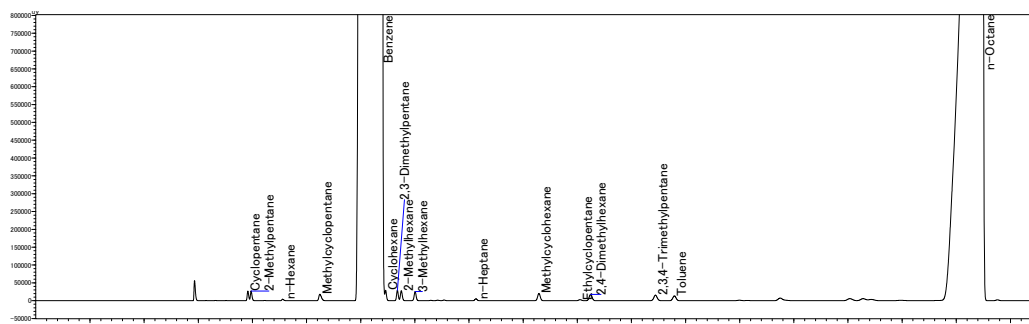


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No.89

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	CH ₄	1ppm	10%	FID
2	C ₂ H ₆	1ppm	10%	FID
3	C ₂ H ₄	1ppm	10%	FID
4	C ₂ H ₂	1ppm	10%	FID
5	C ₃ H ₈	5ppm	50ppm	FID
6	C ₃ H ₆	5ppm	50ppm	FID
7	i-C ₄ H ₁₀	100ppm	7000ppm	FID
8	n-C ₄ H ₁₀	100ppm	7000ppm	FID
9	1,3-C ₄ H ₆	2ppm	10ppm	FID
10	1,3-C ₅ H ₈	1ppm	10%	FID
11	VA	1ppm	10%	FID
12	EA	1ppm	10%	FID
13	1,2-C ₅ H ₈	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

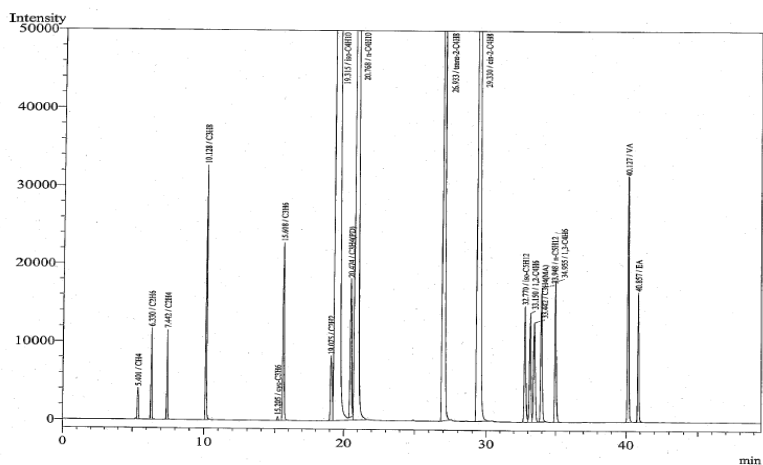


Fig. Chromatogram of FID

Return to Table



Application Data Sheet

No. 111

System Gas Chromatograph

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



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

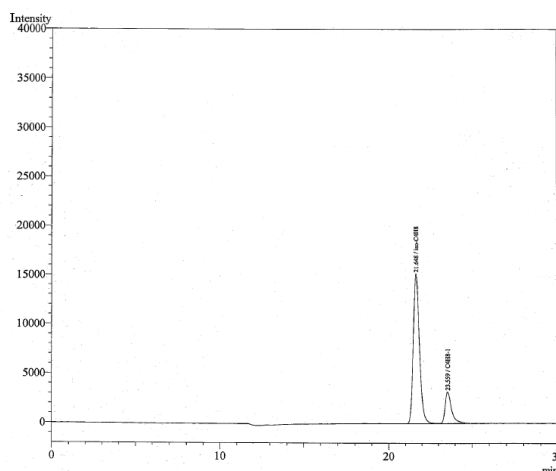


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 109

System Gas Chromatograph

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



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

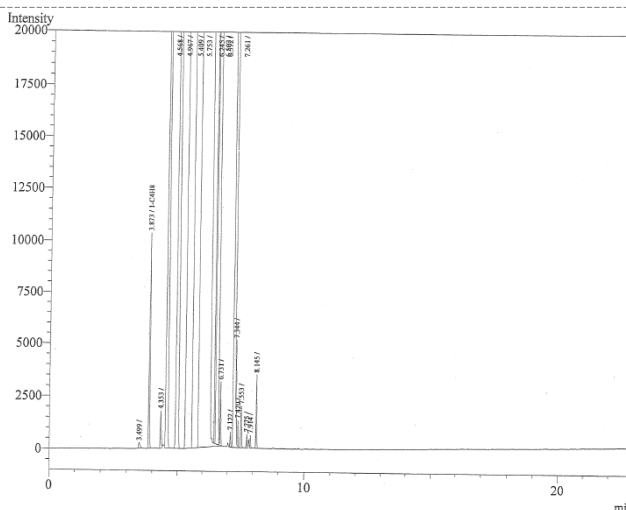


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 69

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	CH ₄	5.0ppm	100.0ppm	FID
2	C ₂ H ₆	5.0ppm	200.0ppm	FID
3	C ₂ H ₄	1.0ppm	10.0ppm	FID
4	C ₃ H ₈	5.0ppm	100.0ppm	FID
5	C ₂ H ₂	0.1ppm	10%	FID
6	VA	1.0ppm	10%	FID
7	EA	1.0ppm	10%	FID
8	1,2-C ₅ H ₈	1.0ppm	10%	FID
9	1,3-C ₅ H ₈	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

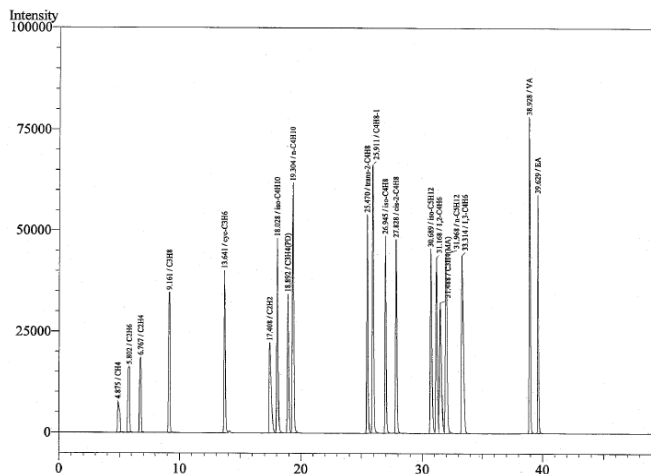


Fig. 1 Chromatogram of FID-1

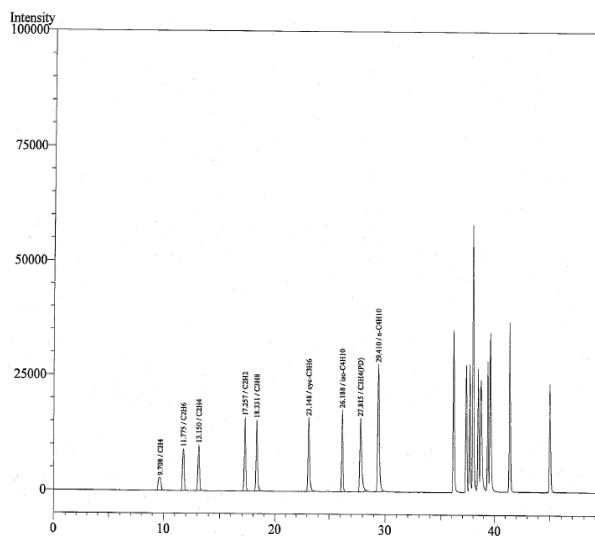


Fig. 2 Chromatogram of FID-2



Return to Table



Application Data Sheet

No. 76

System Gas Chromatograph

Trace Chlorinated Hydrocarbons in O₂ Analysis System Nexis GC-2030CHC GC-2014CHC



Return to Table

This instrument is applied 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

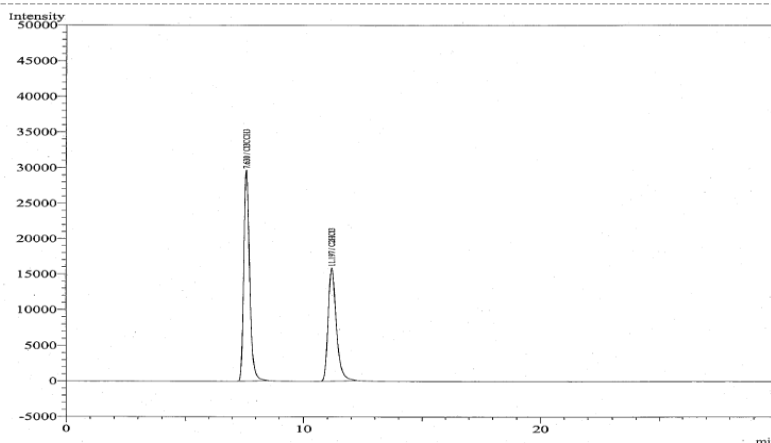


Fig. Chromatogram of ECD

First Edition: November, 2017

Application Data Sheet

No. 75

System Gas Chromatograph

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

Nexis GC-2030EO GC-2014EO



This instrument is applied 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

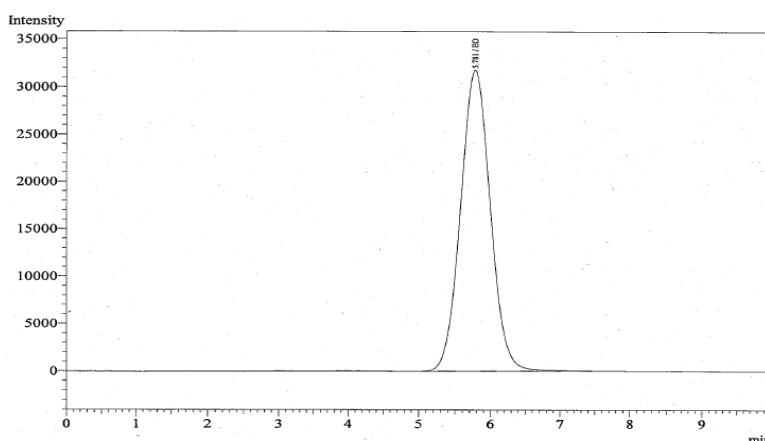


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No. 77

System Gas Chromatograph

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



This instrument is applied 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

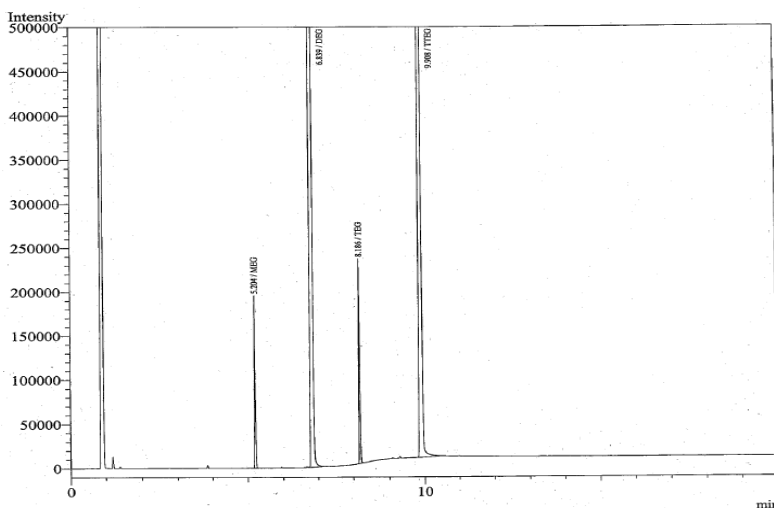


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No.91

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

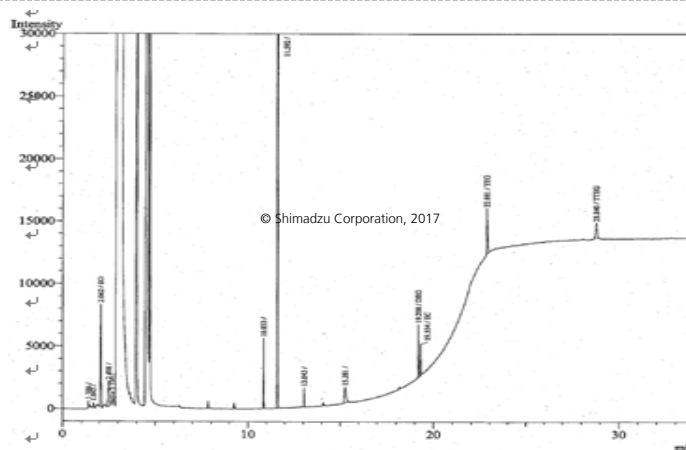


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 180

System Gas Chromatograph

Octans and Lower Boiling Hydrocarbons in Olefin-Free Gasolines

Nexis GC-2030LBH3

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

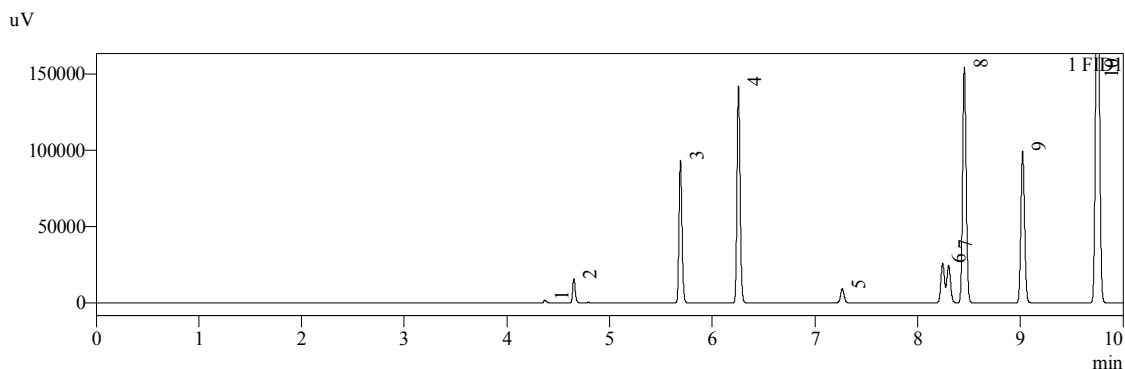


Fig. 1 Chromatogram of FID - 1 of 4

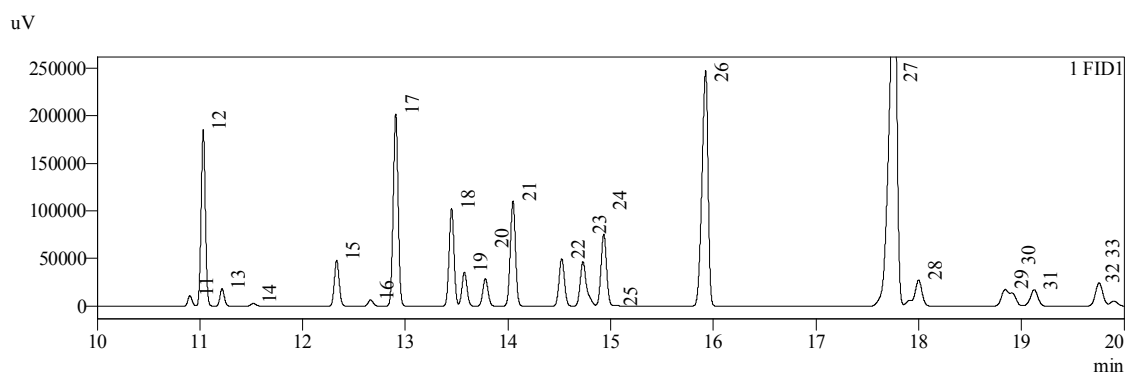


Fig. 2 Chromatogram of FID - 2 of 4

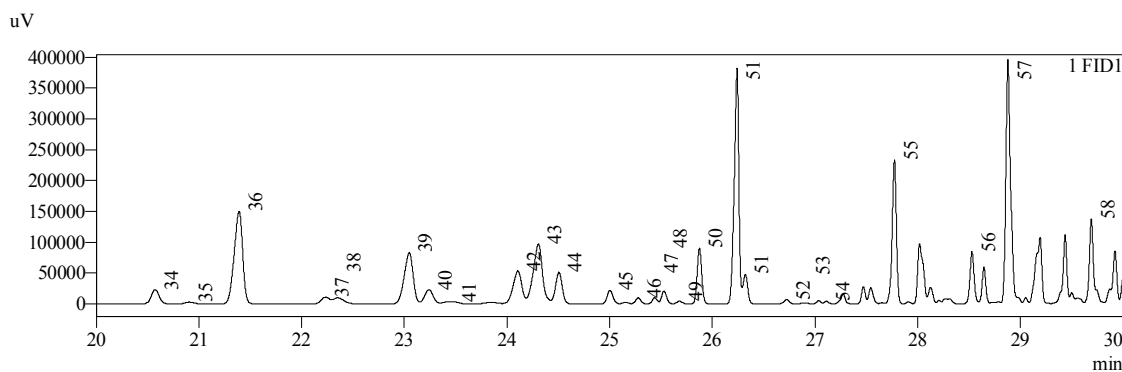


Fig. 3 Chromatogram of FID - 3 of 4

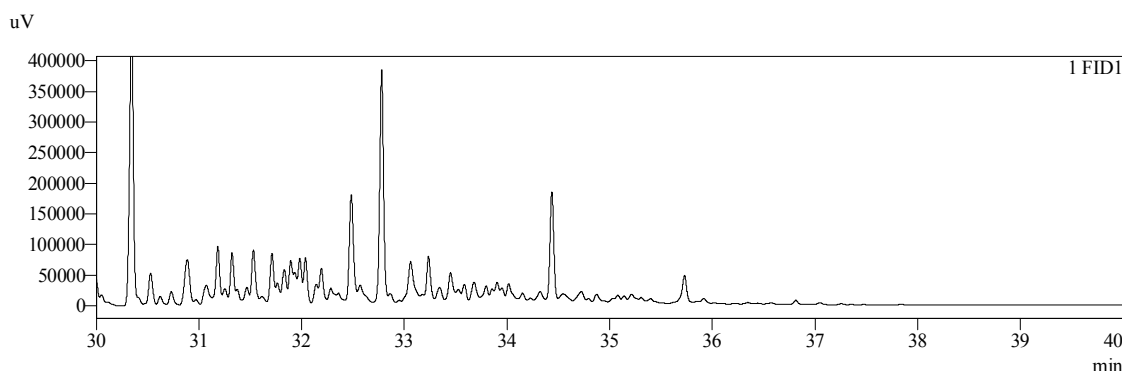


Fig. 4 Chromatogram of FID - 4 of 4

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

Application Data Sheet

No. 182

System Gas Chromatograph

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

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.



Return to
Table

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°C 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

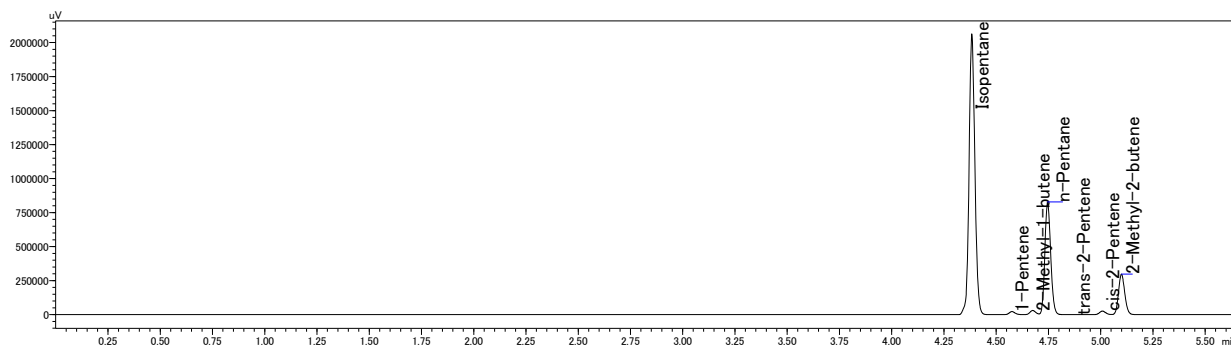


Fig. 1 Chromatogram of FID - 1 of 2



Return to Table

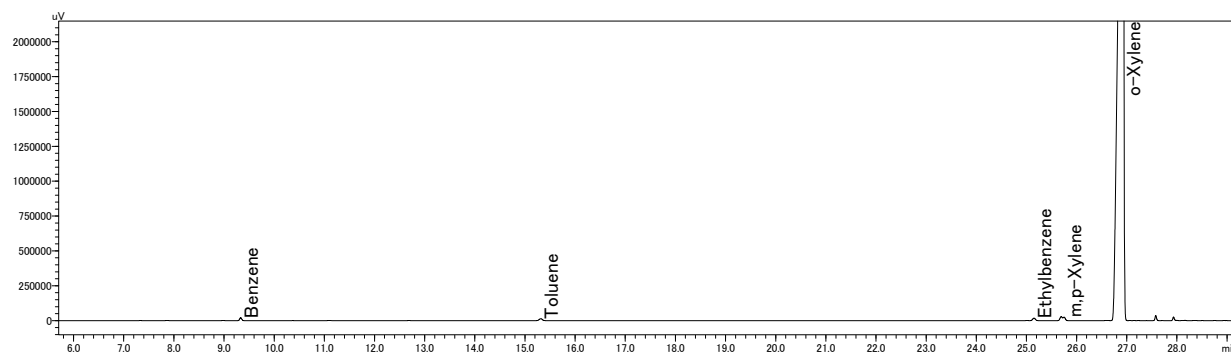


Fig. 2 Chromatogram of FID - 2 of 2

Application Data Sheet

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

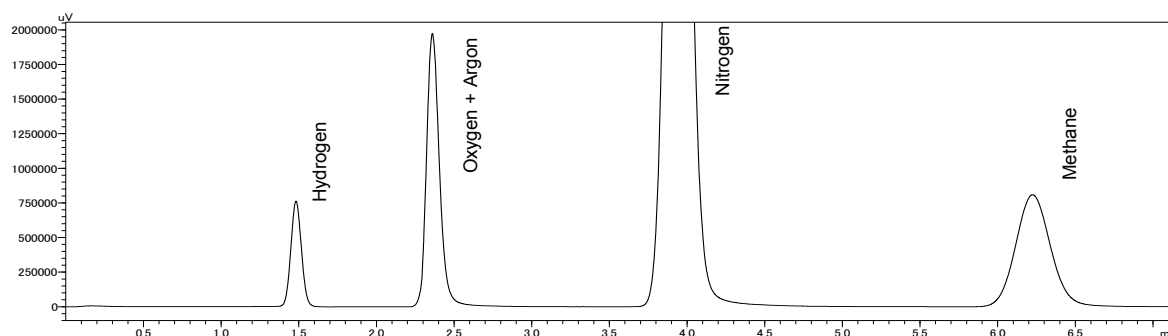


Fig. 1 Chromatogram of PDHID

First Edition: November, 2017

Application Data Sheet

No.52

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	CH ₄	0.010%	80.0%	FID
2	C ₂ H ₄	0.010%	10.0%	FID
3	C ₂ H ₆	0.010%	10.0%	FID
4	C ₂ H ₂	0.010%	10.0%	FID
5	C ₃ H ₈	0.001%	5.0%	FID
6	C ₃ H ₆	0.001%	5.0%	FID
7	i-C ₄ H ₁₀	0.001%	1.0%	FID
8	n-C ₄ H ₁₀	0.001%	1.0%	FID
9	Propadiene(C ₃ H ₄)	0.001%	1.0%	FID
10	Trans-C ₄ H ₈	0.001%	0.5%	FID
11	1-C ₄ H ₈	0.001%	0.5%	FID
12	i-C ₄ H ₈	0.001%	0.5%	FID
13	Cis-2-C ₄ H ₈	0.001%	0.5%	FID
14	i-C ₅ H ₁₂	0.001%	0.5%	FID
15	n-C ₅ H ₁₂	0.001%	0.5%	FID
16	1,3-C ₄ H ₆	0.001%	0.5%	FID
17	C ₃ H ₄	0.001%	0.5%	FID
18	C ₆ ⁺	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

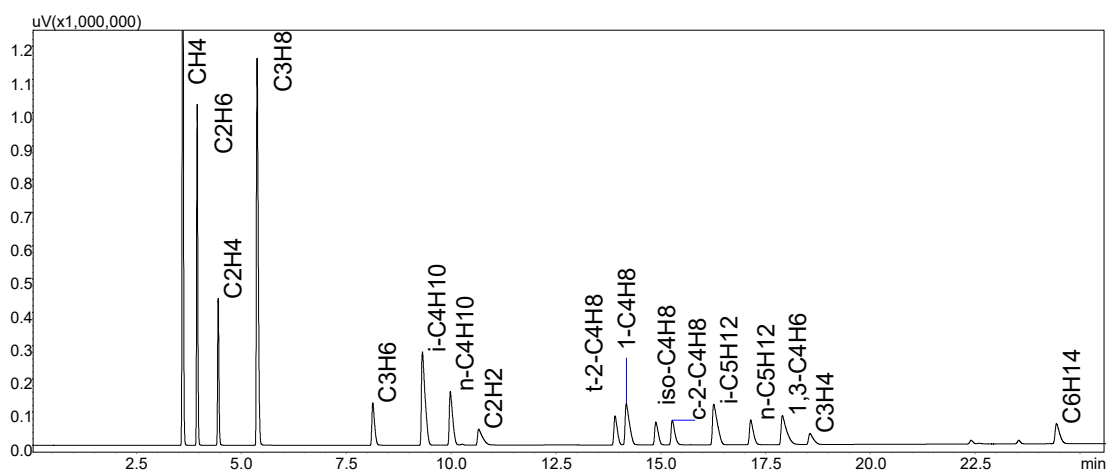


Fig. Chromatogram of FID

Return to Table

Application Data Sheet

No. 177

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.



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

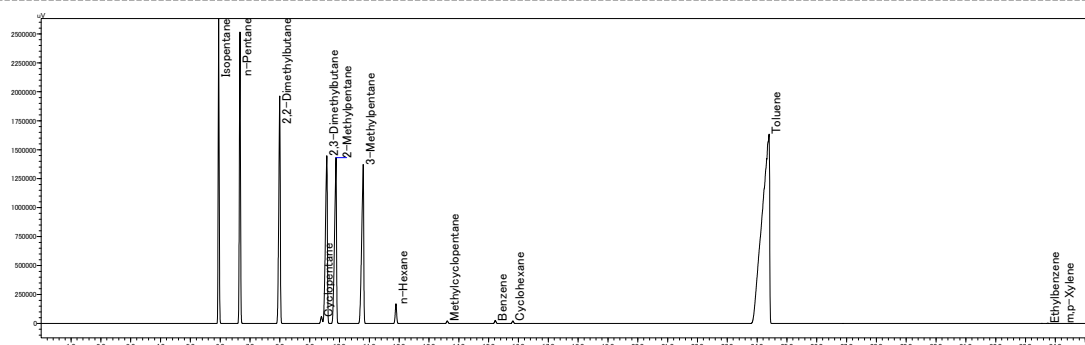


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 179

System Gas Chromatograph

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

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

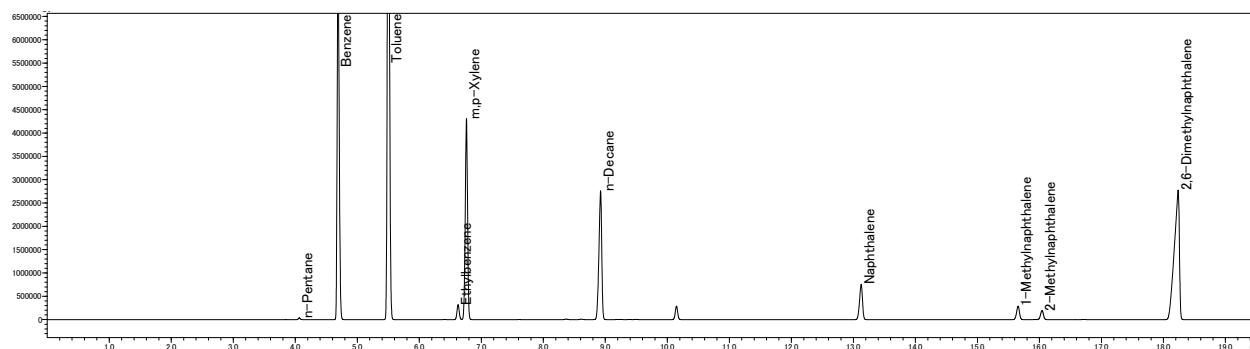


Fig. 1 Chromatogram of FID

First Edition: November, 2017



Return to Table

Application Data Sheet

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

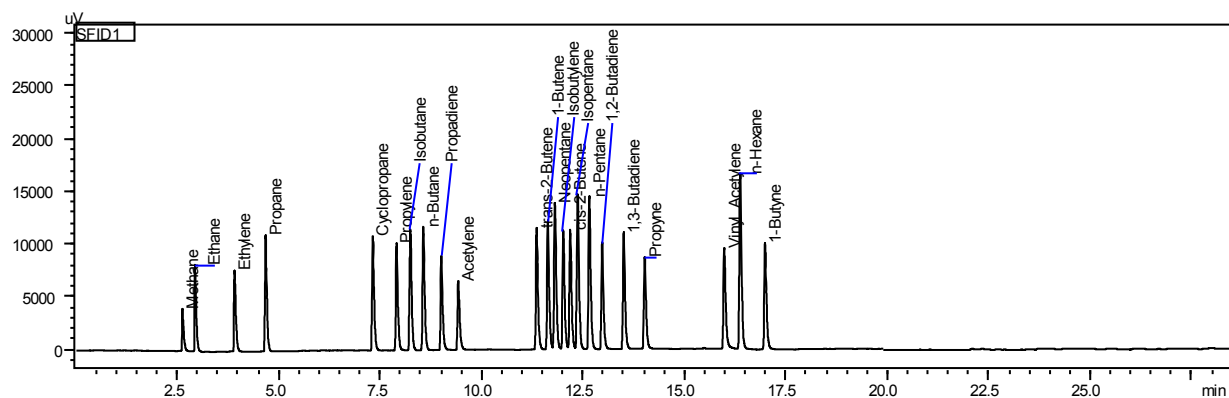


Fig. 1 Chromatogram of FID



Return to Table

Application
Data Sheet

No.49

System Gas Chromatograph

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



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, O₂ and 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, H₂, Ar, O₂, N₂

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	He	0.005%	10%
2	H ₂	0.005%	10%
3	Ar	0.005%	10%
4	O ₂	0.005%	20%
5	N ₂	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

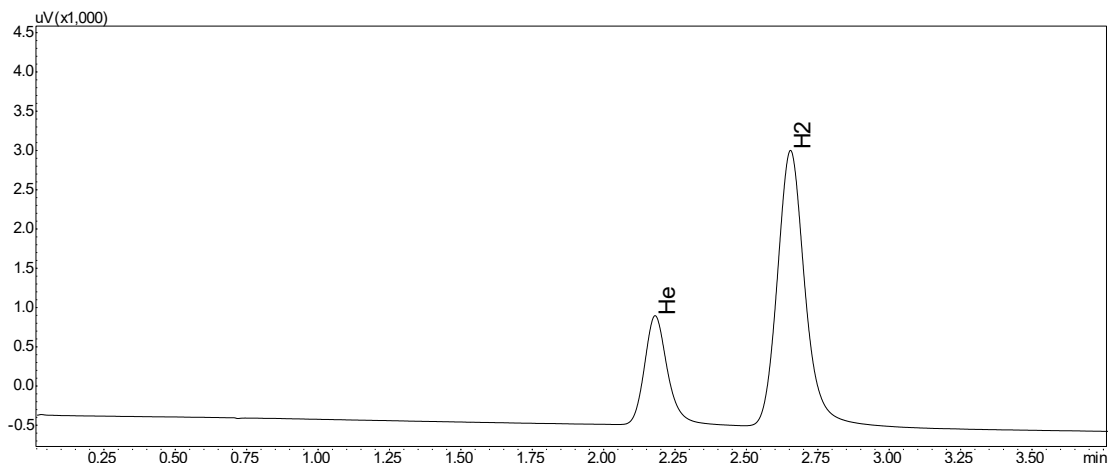


Fig. 1 Chromatogram of TCD

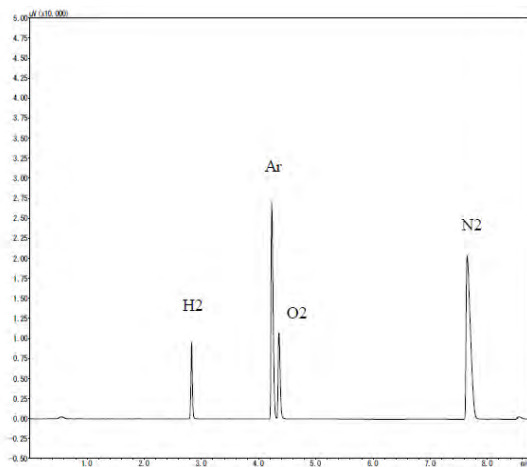


Fig. 2 Chromatogram of TCD



Return to
Table

Application Data Sheet

No.53

System Gas Chromatograph

Permanent Gas with CO/CO₂ Gas Analysis System Nexis GC-2030PCC1 GC-2014PCC1



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:

O₂, N₂, CO, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	O ₂	0.01%	50%	TCD-1
2	N ₂	0.01%	50%	TCD-1
3	CO	0.01%	10%	TCD-1
4	CH ₄	0.01%	90%	TCD-1
5	CO ₂	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

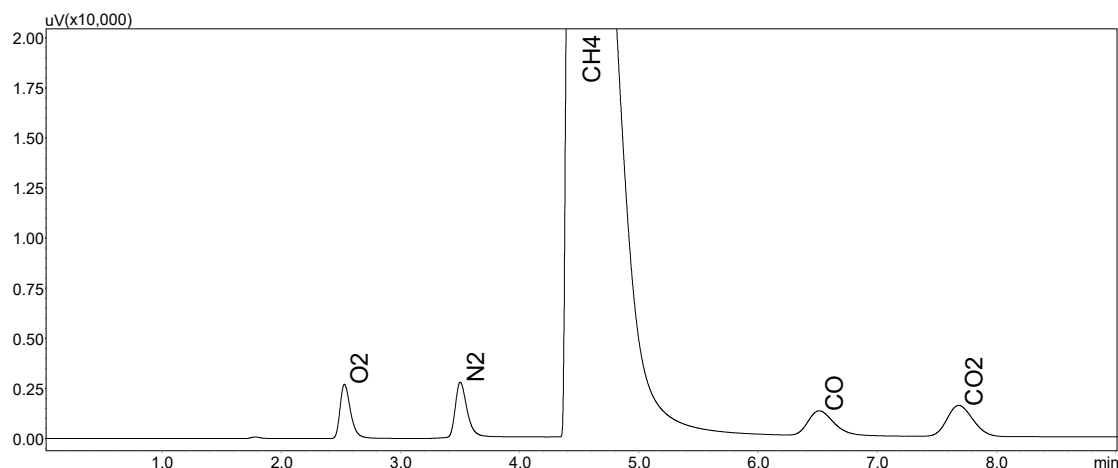


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No. 54

System Gas Chromatograph

Permanent Gas with CO/CO₂ Gas Analysis System Nexis GC-2030PCC2 GC-2014PCC2



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:

O₂, N₂, CO, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	O ₂	0.01%	50%	TCD-1
2	N ₂	0.01%	50%	TCD-1
3	CO	0.01%	10%	TCD-1
4	CH ₄	0.01%	90%	TCD-1
5	CO ₂	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

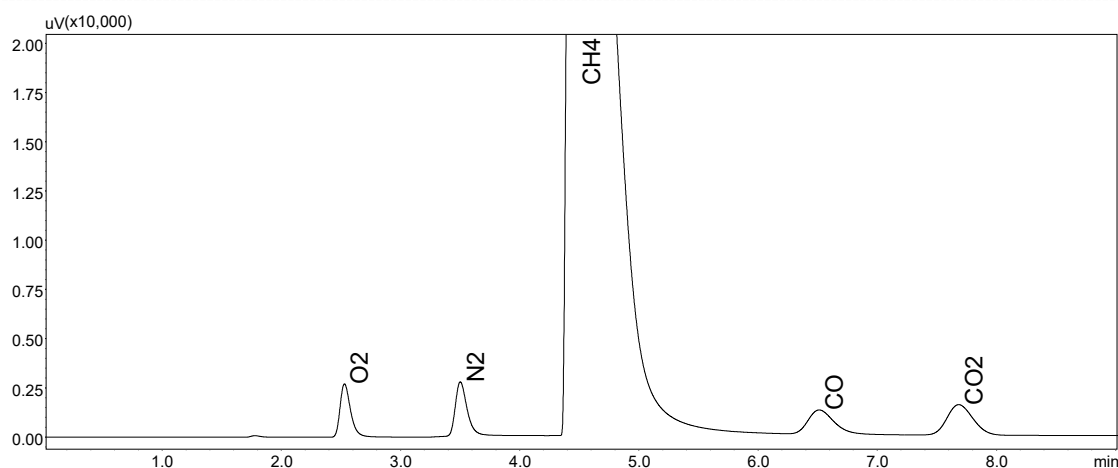


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No.80

System Gas Chromatograph

O₂ – 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:

O₂, N₂, Ar, CO, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	Ar+O ₂	0.05%	30%	TCD-2
2	N ₂	0.05%	100%	TCD-2
3	CH ₄	0.05%	90%	TCD-2
4	CO	0.05%	30%	TCD-2
5	O ₂	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

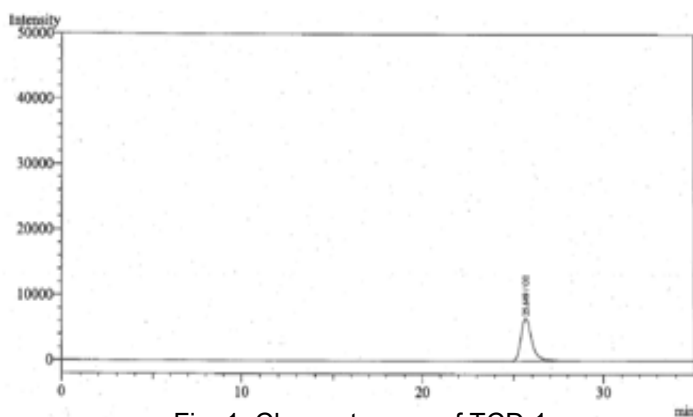


Fig. 1 Chromatogram of TCD-1

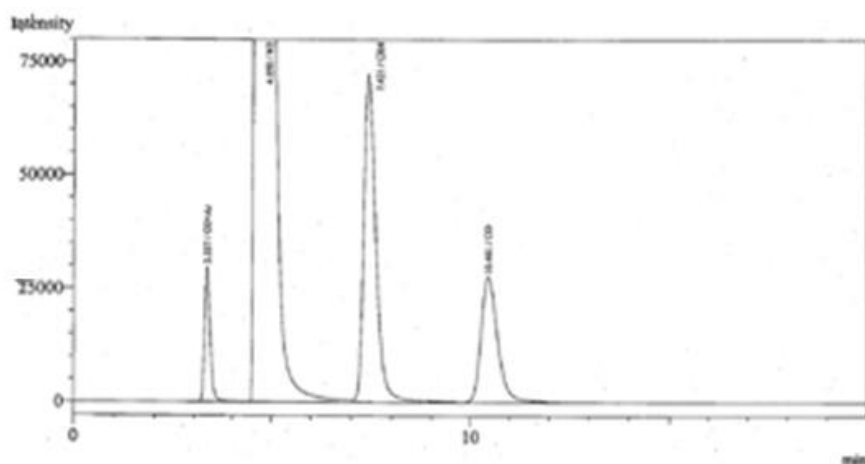


Fig. 2 Chromatogram of TCD-2



Return to
Table

Application Data Sheet

No. 17

System Gas Chromatograph

High Sensitive CO, CO₂, CH₄ 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, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CO	1.0ppm	100ppm
2	CO ₂	1.0ppm	100ppm
3	CH ₄	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, CO₂, and CH₄ pass through a methanizer and detected with FID
- 6 minutes analysis time

Typical Chromatograms

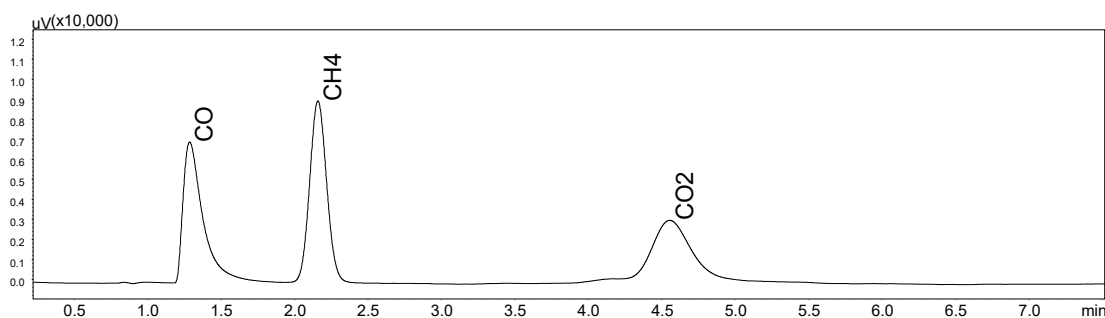


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 18

System Gas Chromatograph

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



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, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CO	0.01%	20%
2	CO ₂	0.01%	20%
3	CH ₄	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, CO₂, CH₄ reach TCD
- 4 minutes analysis time

Typical Chromatograms

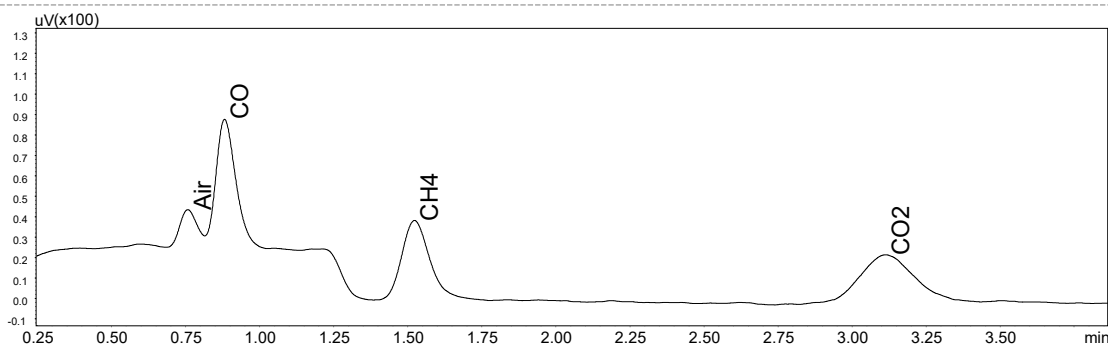


Fig. 1 Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No. 19

System Gas Chromatograph

CO, CO₂, CH₄ Analysis Nexis GC-2030CCC3 GC-2014CCC3



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, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CO	1.0ppm	100ppm
2	CO ₂	1.0ppm	100ppm
3	CH ₄	1.0ppm	100ppm
4	CO	0.01%	20%
5	CO ₂	0.01%	20%
6	CH ₄	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, CO₂, and CH₄ reach TCD
- Hydrocarbons are back flush by the pre-column while trace CO, CO₂, CH₄ pass through to a methanizer and detection with FID
- 6 minutes analysis time

Typical Chromatograms

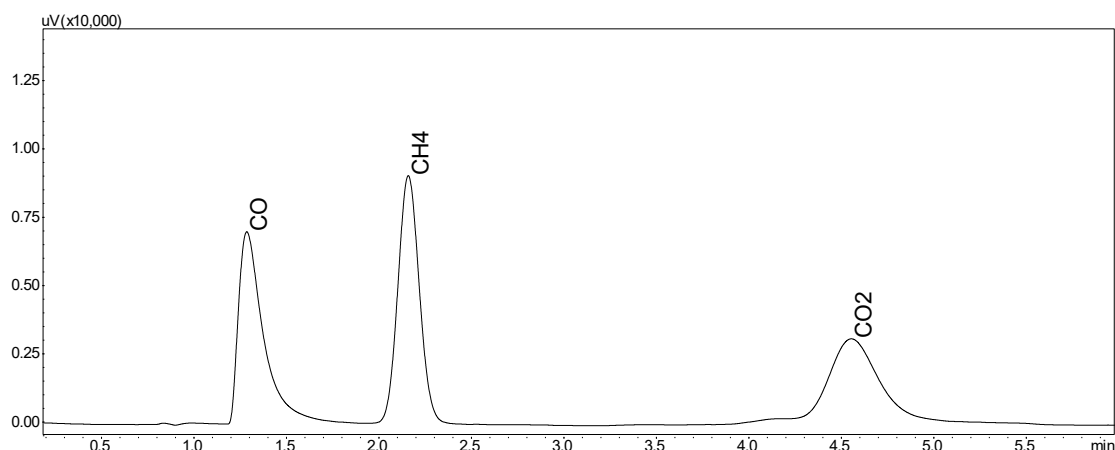


Fig. 1 Chromatogram of FID-1

Typical Chromatograms

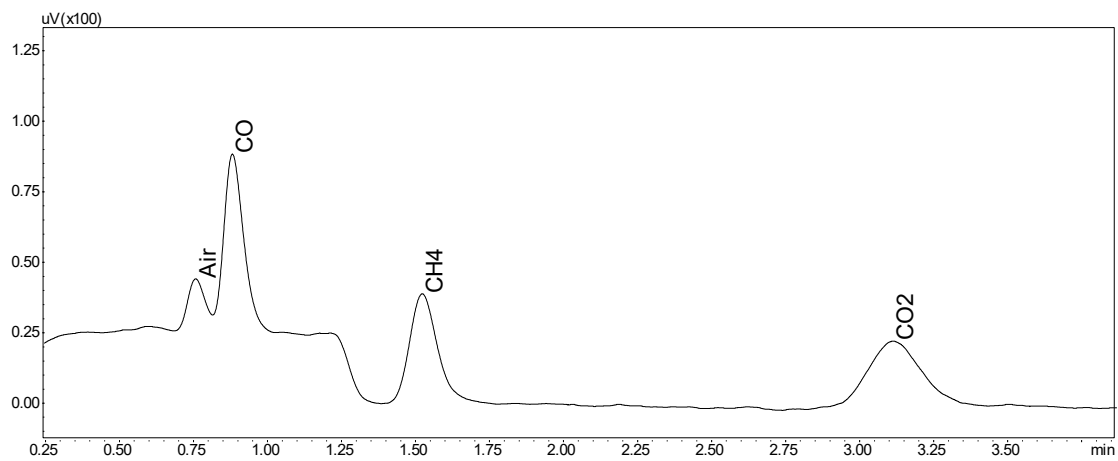


Fig. 1 Chromatogram of TCD-1

Return to Table



Application Data Sheet

No.20

System Gas Chromatograph

High Sensitive CO, CO₂, CH₄ Analysis Nexis GC-2030CCC4 GC-2014CCC4



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, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CO	1.0ppm	100ppm
2	CO ₂	1.0ppm	100ppm
3	CH ₄	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, CO₂, CH₄ reach FID.
- Good separation between CH₄ and CO with MS-13X packed column
- 13 minutes analysis time

Typical Chromatograms

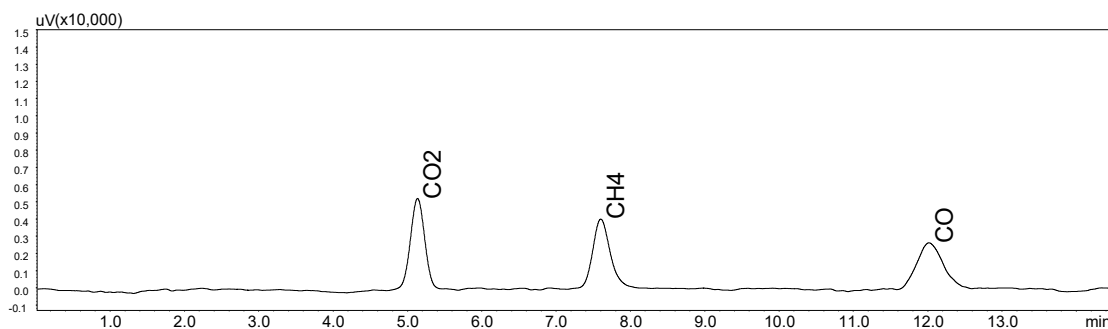


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application
Data Sheet

No.21

System Gas Chromatograph

**High Sensitive CO, CO₂, CH₄ Analysis
Nexis GC-2030CCC5
GC-2014CCC5**



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, CO₂, CH₄

Concentration Range:

No.	Name of Compound	Concentration Range	
		Low Conc.	High Conc.
1	CO	1.0ppm	100ppm
2	CO ₂	1.0ppm	100ppm
3	CH ₄	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 O₂ are removed by the third valve by using cutting technology
- Hydrocarbons and water are backflushed by the pre-column while trace CO, CO₂, and CH₄ reach FID
- Good separate CH₄ and CO with MS-13X packed column
- 13 minutes analysis time

Typical Chromatograms

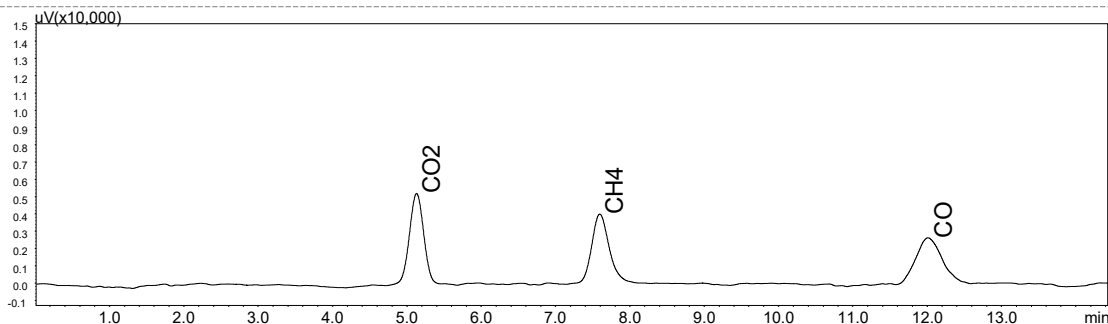


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 178

System Gas Chromatograph

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

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)

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.

Methods met:

UOP-603

System Features

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

Typical Chromatograms

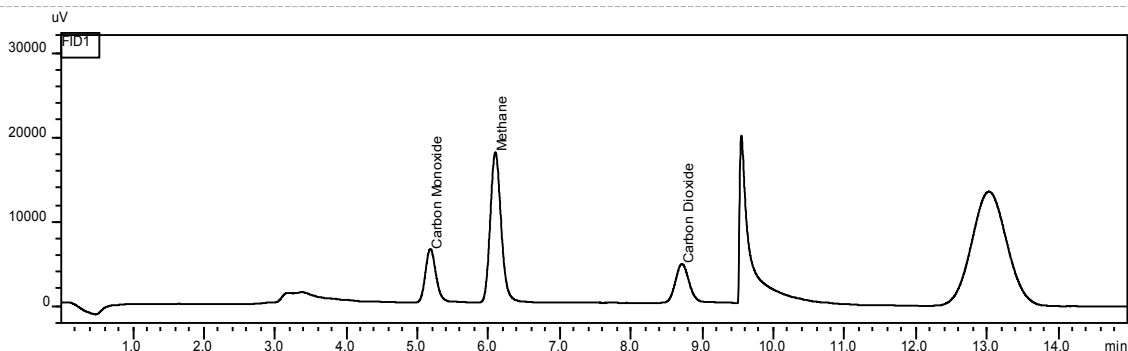


Fig. 1 Chromatogram of FID

First Edition: November,2017

Application Data Sheet

No. 108

System Gas Chromatograph

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



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

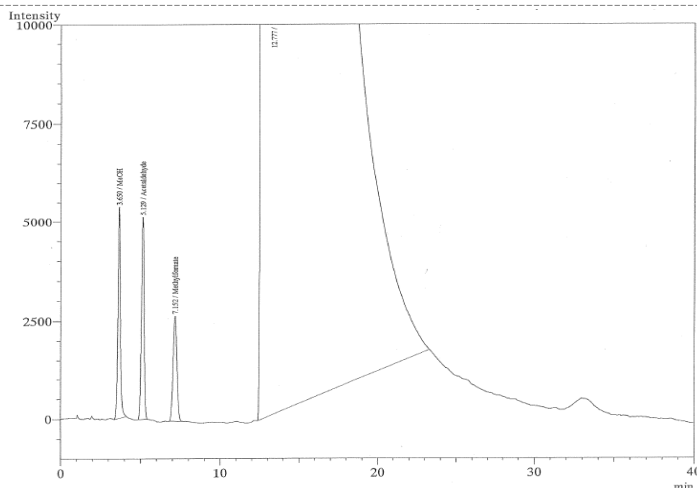


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 104

System Gas Chromatograph

Formaldehyde in Propylene Oxide Analysis System Nexis GC-2030FOR GC-2014FOR



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

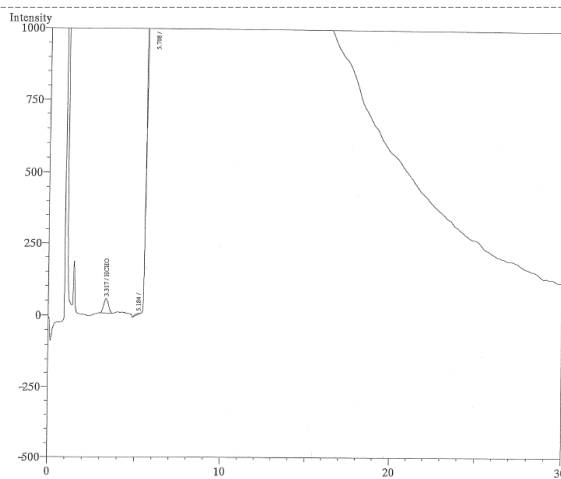


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

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

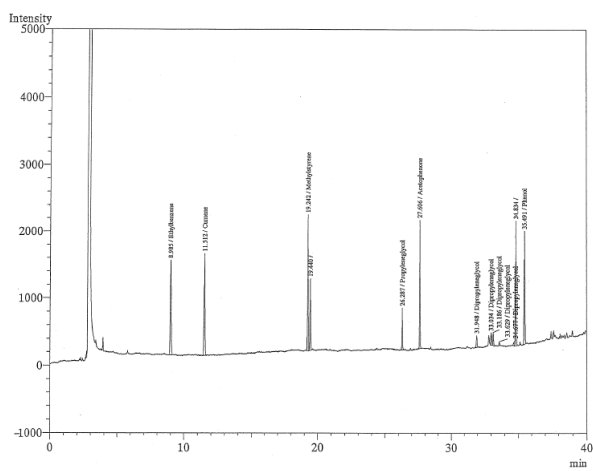


Fig. Chromatogram of FID

Return to Table



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Application Data Sheet

No. 185

System Gas Chromatograph

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

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

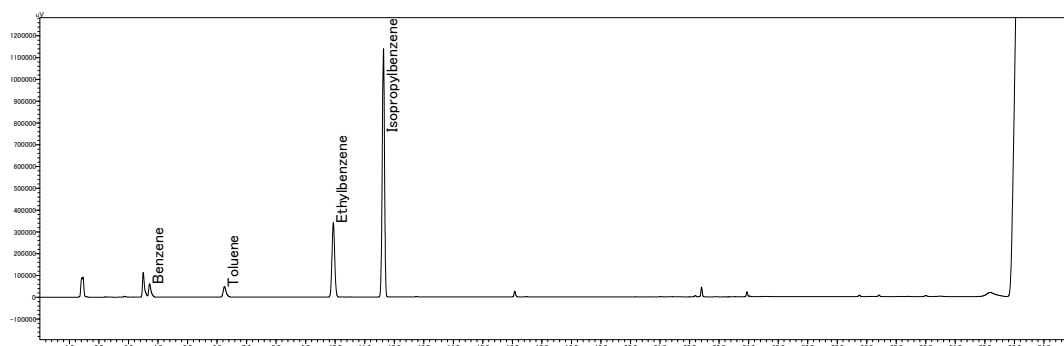


Fig. 1 Chromatogram of FID

Application Data Sheet

No. 113

System Gas Chromatograph

Volatile Organic Compounds in Atmospheric Air Analysis System Nexis GC-2030VOC GC-2014VOC



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

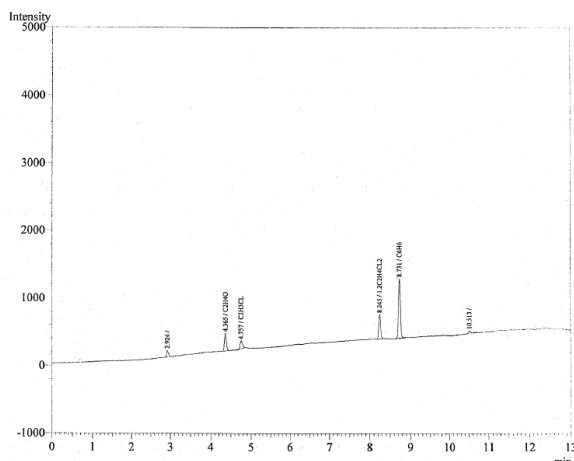


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

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

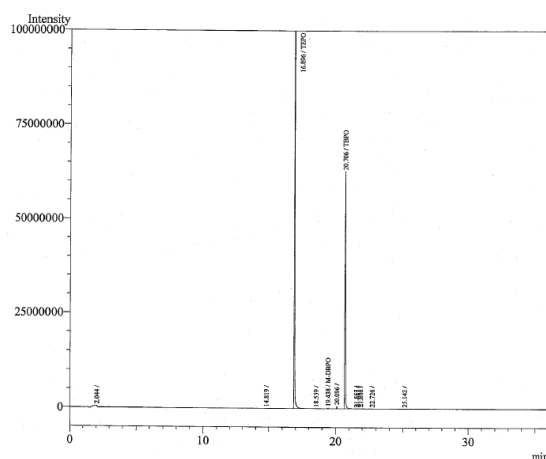


Fig. Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No.84

System Gas Chromatograph

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



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:

H₂O

Concentration Range:

No.	Name of Compound	Concentration Range		Detector
		Low Conc.	High Conc.	
1	H ₂ O	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

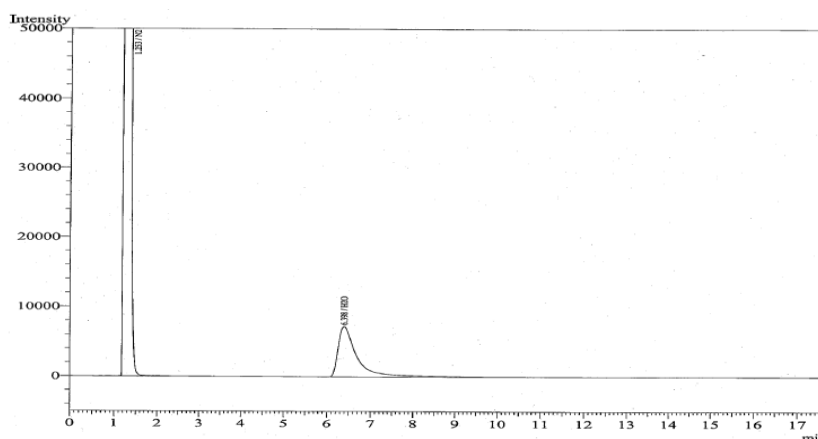


Fig. Chromatogram of TCD

First Edition: November, 2017

Application Data Sheet

No. 170

System Gas Chromatograph

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



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

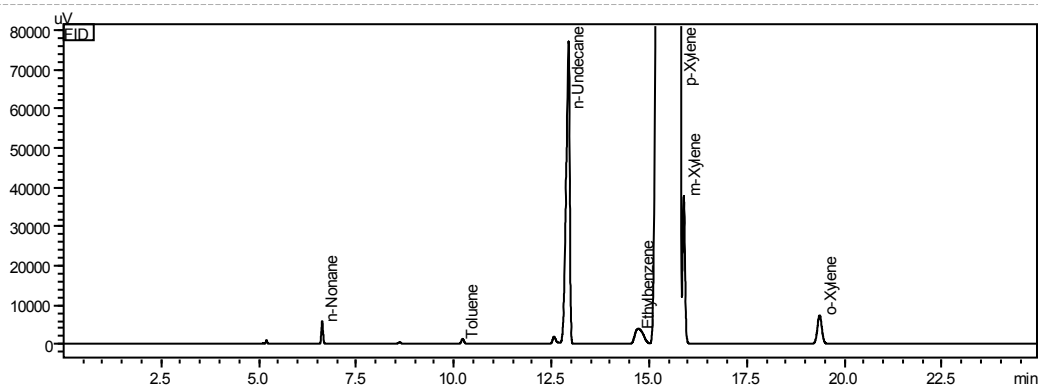


Fig. 1 Chromatogram of FID

First Edition: November, 2017

Application Data Sheet

No. 181

System Gas Chromatograph

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

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

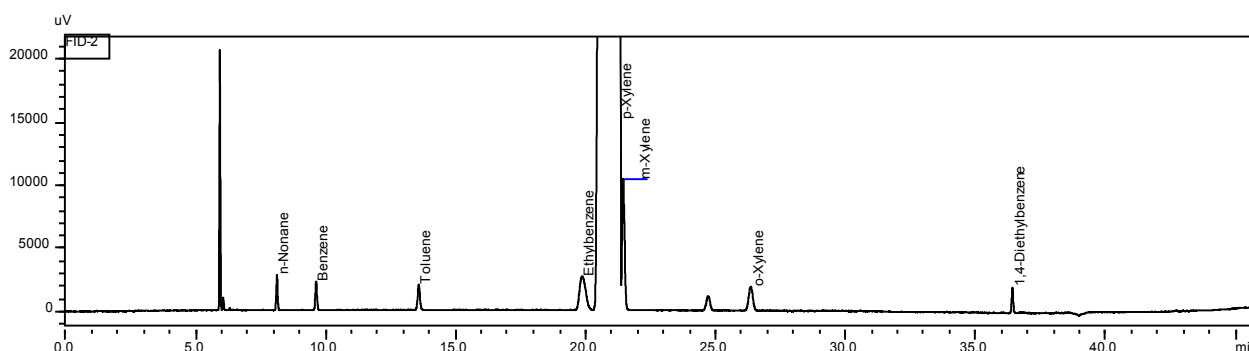


Fig. 1 Chromatogram of FID

First Edition: November, 2017



Return to Table

Application Data Sheet

No. 187

System Gas Chromatograph

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

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.



Return to Table

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

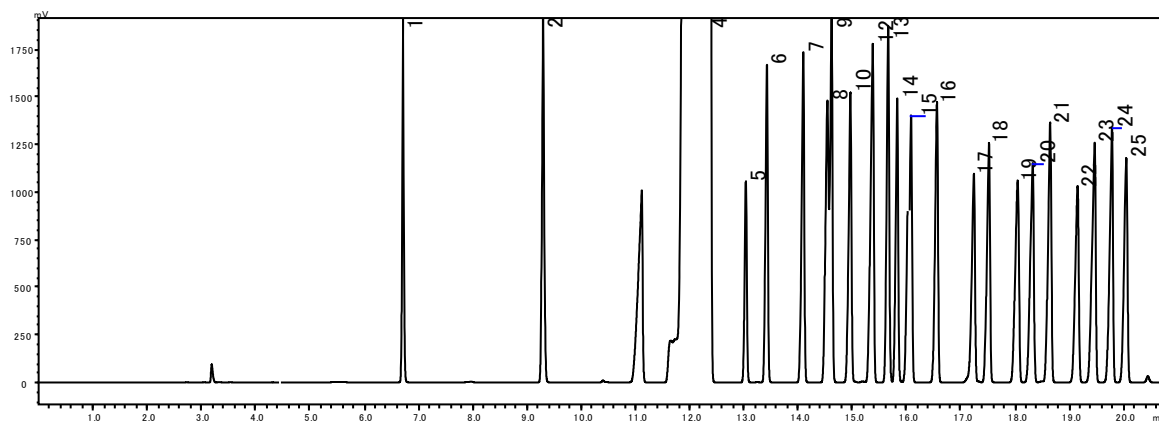


Fig. 1 Chromatogram of FID

- | | |
|--------------------------------------|--------------------------------|
| 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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