



# NATURAL GAS ANALYSIS

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# NATURAL GAS ANALYSIS



*Time is Money.*

Benjamin Franklin

Time is always a key factor in today's laboratories productivity.

## Master your Time with the DANI Gas Analyzers.

The ability to provide the proper configuration to meet the most challenging analytical demands comes from a long and proven experience and a deep industry knowledge. As requirements are constantly changing, even a highly reliable instrumentation could not be enough to succeed in getting trustworthy results: complete and guaranteed solutions are essential to comply with the latest industry standards and specifications.

After a long working relationship with its customers to know and to best match their real needs, DANI Instruments has developed key analytical solutions that cover a broad array of applications, requirements and protocols in the environmental industry.

Master DANI Air Analyzers are **PRE-CONFIGURED, PRE-ASSEMBLED AND FACTORY-TESTED SYSTEMS** specifically designed for peculiar analyses. The analyzers include the **HARDWARE**, the **SOFTWARE**, **COLUMNS AND CONSUMABLES**, the **OPTIMIZED ANALYSIS METHOD**, the **ANALYTICAL CONDITIONS**, and the **DOCUMENTATION** to run up your analysis from day one.

### **PRE-CONFIGURED, PRE-ASSEMBLED AND FACTORY-TESTED SYSTEMS**

The installation process is faster than ever before and all the startup procedure is oversimplified ensuring immediate analytical performance and results.

### **HARDWARE AND SOFTWARE**

DAA Analyzers are pre-engineered systems based on the versatility, flexibility and robustness of the proven Master GC hardware. All the Master GC parameters are set prior the shipment.

### **COLUMNS AND CONSUMABLES**

No more doubts about the proper column, parts and supplies. DAA Analyzers are delivered with all you may need for your analysis.\*

### **OPTIMIZED ANALYSIS METHOD**

Analytical methods are pre-loaded to be immediately used for the determination of pollutants in air. Whenever possible, reduction of analysis time and amounts of toxic solvents are considered. Method development time and costs are thus dramatically reduced.

### **ANALYTICAL CONDITIONS**

DAA Analyzers are designed to perfectly accomplish the analytical conditions of interest.

### **DOCUMENTATION**

A getting started manual, calibration and method files, and all the information for a quick startup are included.



\* Chemicals are not supplied



### DANI MASTER GC

- Intuitive and easy-to-use touchscreen interface.
- Complete range of injectors:
  - Split/Splitless Injector
  - Programmable Temperature Vaporizer (PTV)
  - Packed Injector
- Wide selection of detectors:
  - Flame Ionization Detector (FID)
  - Electron Capture Detector (ECD)
  - Nitrogen-Phosphorus Detector (NPD)
  - Flame Photometric Detector (FPD)
  - Thermal Conductivity Detector (TCD)
  - Pulse Discharge Detector (PDD)
  - Master TOF-MS Time of Flight Mass Spectrometer
- Extensive Choice of Dedicated Devices:
  - Auxiliary ovens
  - Gas sampling and switching valves
  - Liquid sampling valves
  - GC oven cryogenic cooling device
  - Methanizer

### DANI MASTER AUX

#### Auxiliary Ovens for Isothermal Temperature

- Up to 7 valves (5 gas + 2 liquids)
- Up to 250° C
- Up to 2 auxiliary gas valves
- Up to 6 needle valves
- Extremely compact design
- Two models available with different capacities to house valves and columns for dedicated analyses



### DANI MASTER AS

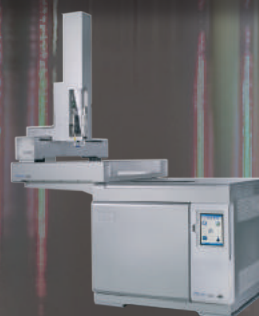
#### Liquid Autosampler

- Superior flexibility, repeatability, and performance
- Easy-to-use
- 160 samples capacity
- No sample degradation or solvent evaporation
- up to 7 syringe capacity types
- unmatched injection capabilities

### DANI MASTER SHS

#### Static Headspace Sampler

- A robust and flexible system to meet complex and versatile needs
- Reliable results and exceptional reproducibility
- Intuitive, powerful, and straightforward user interface
- Highest sample capacity with a 120-position vial tray
- Unlimited priority sample position
- Unmatched oven capacity: 18 vials simultaneously



# NATURAL GAS ANALYSIS

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Configuration	Typical Detected Compounds	Official Methods Met	Sample Type
<b>DGA-003 Natural Gas Analyzer for Permanent Gas, H<sub>2</sub>, and Hydrocarbons</b>			
Three channels with FID, dual $\mu$ TCD, micro-packed columns, three valves, and auxiliary oven.	hydrogen helium nitrogen carbon dioxide methane ethane	propane butane <i>iso</i> -butane pentane C <sub>6</sub> + (hexane and higher hydrocarbons)	ASTM 1945 ASTM 1946 GPA 2177 ASTM 2163 UOP 539 ISO 6874
			Gas Liquid
<b>DGA-008 Natural Gas Analyzer for Hydrocarbons, CO, and CO<sub>2</sub></b>			
Two channels with FID, packed and capillary columns, three valves, methanizer, and auxiliary oven.	oxygen nitrogen carbon dioxide carbon monoxide methane ethane	propane butane <i>iso</i> -butane pentane <i>iso</i> -pentane C <sub>6</sub> + (hexane and higher hydrocarbons)	ASTM 2505 UOP 603
			Gas
<b>DGA-009 Natural Gas Analyzer for CO, CO<sub>2</sub>, and Hydrocarbons</b>			
Two channels with FID, packed and capillary columns, one valve, methanizer.	Hydrocarbons from C <sub>14</sub> to C <sub>16</sub> carbon monoxide carbon dioxide		UOP 603
			Gas
<b>DGA-010 Natural Gas Analyzer for Hydrogen and Helium</b>			
Dual channels with $\mu$ TCD, micro-packed columns, two valves, auxiliary oven.	hydrogen helium		ASTM 2504
			Gas
<b>DGA-011 Natural Gas Analyzer for Natural Gas with Permanent Gas Separation</b>			
Single channel with $\mu$ TCD, micro-packed columns, two valves (sampling and switching), auxiliary oven.	oxygen methane nitrogen carbon dioxide dicarbon		ASTM 1945 ASTM 1946
			Gas Liquid
<b>DGA-012 Natural Gas Analyzer for Hydrocarbons</b>			
Dual channels with TCD, FID, wide bore capillary column, one valve, auxiliary oven.			
<b>DGA-013 Natural Gas Analyzer for CO, CO<sub>2</sub>, and Hydrocarbons</b>			
Dual channels with FID, one valve, methanizer, auxiliary oven.			ASTM 2505 UOP 603
<b>DGA-014 Natural Gas Analyzer for Natural Gas with Permanent Gas separation - H<sub>2</sub> and He</b>			
Dual channels with dual $\mu$ TCD, three valves, auxiliary oven.			ASTM 1945 ASTM 1946 GPA 2177 ASTM 2504
<b>DGA-016 Natural Gas Analyzer for Natural Gas with Permanent Gas and H<sub>2</sub>S</b>			
Single channel with $\mu$ TCD, two valves, capillary columns, auxiliary oven.	hydrogen argon oxygen methane nitrogen	carbon monoxide carbon dioxide dicarbon hydrogen sulfide	
			Gas

Configuration	Typical Detected Compounds	Official Methods Met	Sample Type
<b>DGA-017 Natural Gas Analyzer for natural Gas</b>			
Single channel with TCD, packed columns, two valves, and auxiliary oven.	oxygen nitrogen methane carbon dioxide ethane	propane n-butane isobutane n-pentane isopentane hexane	ASTM 1945 ASTM 1946 GPA 2177 Gas
<b>DGA-018 Natural Gas Analyzer for Hydrocarbons and Sulfur Compounds</b>			
	methane ethane n-butane isobutane	n-pentane isopentane C <sub>6</sub> + (hexane and higher hydrocarbons)	
<b>DGA-022 Natural Gas Analyzer for Permanent Gas, Hydrocarbons and H<sub>2</sub>S</b>			
Single channel with TCD and FID, packed columns, three valves, and auxiliary oven.	oxygen nitrogen carbon dioxide methane ethane propane	iso-butane iso-pentane pentane hexane hydrogen sulfide	ASTM 1945 ASTM 1946 GPA 2177 Gas
<b>DGA-023 Natural Gas Analyzer for Permanent Gas, Hydrocarbons, CO and CO<sub>2</sub></b>			
Single channel with TCD, wide bore capillary columns, two valves.	hydrogen oxygen nitrogen methane	carbon monoxide carbon dioxide hydrocarbons up to C <sub>6</sub>	Gas
<b>DGA-024 Natural Gas Analyzer for Permanent Gas and Hydrocarbons</b>			
Dual channels with μTCD, FID, capillary columns, two valves, and auxiliary oven.	oxygen nitrogen carbon dioxide methane ethane	propane n-butane n-pentane i-pentane hexane	ASTM 1945 ASTM 1946 GPA 2177 Gas
<b>DGA-025 Natural Gas Analyzer for Permanent Gas, Hydrocarbons, and Sulfur Compounds</b>			
Three channels with μTCD, FID, FPD, micro-packed and capillary columns, two valves, auxiliary oven.	oxygen carbon monoxide nitrogen carbon dioxide methane ethane	propane n-butane isobutane n-pentane isopentane	ASTM 1945 ASTM 1946 GPA 2177 Gas
<b>DGA-026 Natural Gas Analyzer for Permanent Gas, Hydrocarbons, and CO<sub>2</sub></b>			
Dual channels with μTCD, FID, capillary columns, two valves, auxiliary oven.	carbon dioxide methane ethane propane	i-butane n-butane i-pentane hexane	Gas
<b>DGA-027 Natural Gas Analyzer for Permanent Gas, Hydrocarbons, and CO<sub>2</sub></b>			
Dual channels with μTCD, FID, micro-packed and capillary columns, three valves, auxiliary oven.	carbon dioxide oxygen nitrogen methane	ethane propane i-butane n-butane	Gas
<b>DGA-028 Natural Gas Analyzer for Permanent Gas, Hydrocarbons, H<sub>2</sub>, and CO<sub>2</sub></b>			
Three channels with μTCD, FID, three valves, auxiliary oven.	oxygen nitrogen carbon dioxide hydrogen methane ethane	propane i-butane n-butane i-pentane n-pentane n-hexane	ASTM 1945 ASTM 1946 GPA 2177 Gas

# NATURAL GAS ANALYSIS

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Configuration	Typical Detected Compounds	Official Methods Met	Sample Type
<b>DGA-033 Natural Gas Analyzer for Permanent Gas, CO<sub>2</sub>, Hydrocarbons, COS, H<sub>2</sub>S, CS<sub>2</sub></b>			
Dual channels with FID, $\mu$ TCD, FPD, three valves, and auxiliary oven.	oxygen nitrogen carbon dioxide carbonyl sulfide hydrogen sulfide carbon disulfide methane	ethane propane <i>i</i> -butane <i>n</i> -butane <i>i</i> -pentane <i>n</i> -pentane <i>n</i> -hexane	Gas
<b>DGA-034 Natural Gas Analyzer for Permanent Gas and Hydrocarbons</b>			
Two channels with TCD, packed columns, two valves, and auxiliary oven.	oxygen nitrogen methane carbon dioxide ethane	propane butane hexane  ASTM 1945 ASTM 1946 GPA 2177	Gas
<b>DGA-035 Natural Gas Analyzer for Permanent Gas, H<sub>2</sub>, and Hydrocarbons</b>			
Two channels with FID, $\mu$ TCD, micro-packed and capillary columns, two valves for gas and one valve for liquids, auxiliary oven.	hydrogen oxygen nitrogen carbon dioxide methane carbon monoxide	ethane propane butane pentane C <sub>6</sub> + (hexane and higher hydrocarbons)	Gas Liquid
<b>DGA-036 Natural Gas Analyzer for Permanent Gas, H<sub>2</sub>, and Hydrocarbons</b>			
Three channels with $\mu$ TCD, micro-packed columns, three valves, auxiliary oven.	hydrogen oxygen nitrogen carbon dioxide methane carbon monoxide	ethane propane butane pentane C <sub>6</sub> + (hexane and higher hydrocarbons)	Gas

# NATURAL GAS ANALYSIS

## DGA-003

### Natural Gas Analyzer for Permanent Gas, H<sub>2</sub> and Hydrocarbons Determination

DGA-003 is a three-channels system that allows the accurate determination of permanent gases, H<sub>2</sub>, He, and hydrocarbons through the two channels equipped with the  $\mu$ TCD detectors and the channel equipped with the FID detector. The proper separation of permanent gases and hydrocarbons is possible thanks to the presence of a micro-packed Hayesep column for each TCD channel.

DANI DGA-003 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and Hydrocarbons.

*Master* **DGA-003**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

H<sub>2</sub>, He, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, ethane, propane, butane, *iso*-butane, pentane, and C<sub>6</sub>+ (hexane and higher hydrocarbons)

#### OFFICIAL METHODS MET:

ASTM 1945, ASTM 1946, GPA2177, ASTM 2163, UOP 539, ISO 6874

#### KEY FEATURES & BENEFITS:

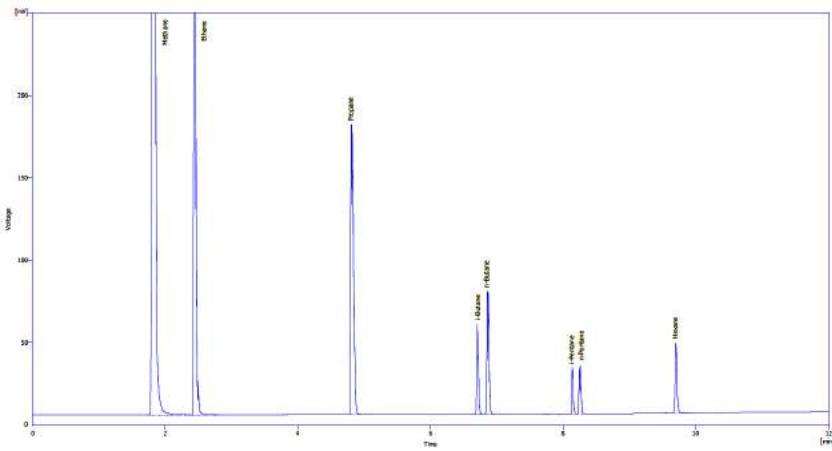
4 micro-packed and a capillary columns installed for a complete and accurate separation;

Gas sample is introduced simultaneously into each analytical channel by the 10-port valve;

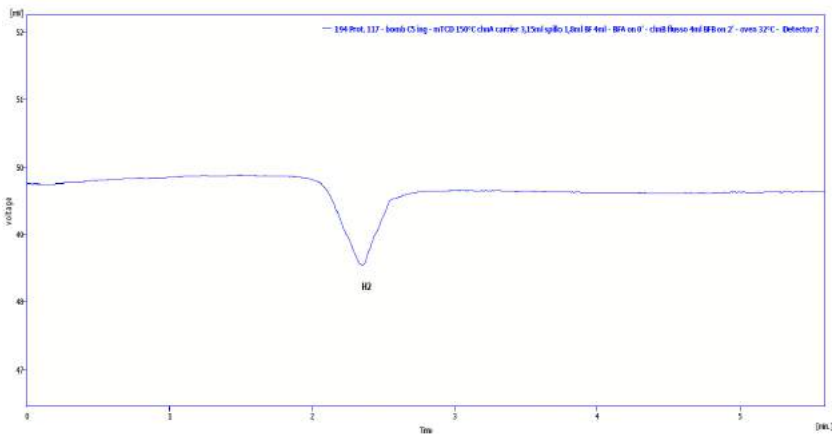
The external valve gives the possibility to introduce liquid samples into the third channel;

The  $\mu$ TCD detector has advantages for speed, accuracy and reduced dead volumes for permanent gases and H<sub>2</sub>;

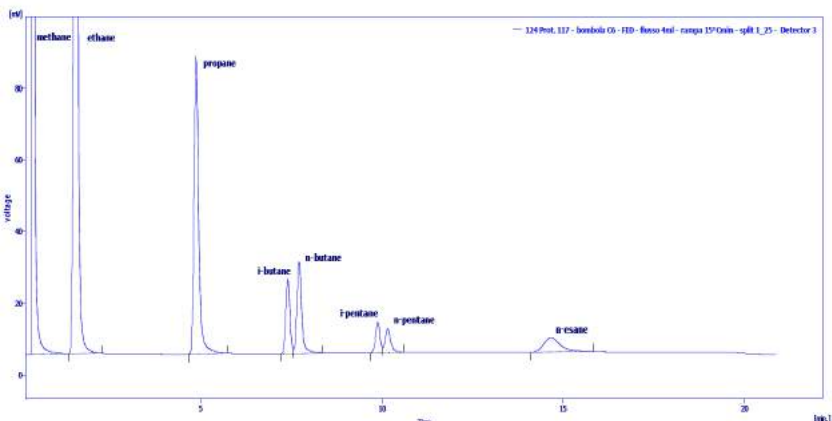
The FID detector is very sensitive to the hydrocarbons components with an excellent linearity across a wide range of concentrations;



TCD (channel A) chromatogram of the gas standard mixture (C6). Labeled peaks correspond to:  $O_2$ ,  $CO_2$ ,  $N_2$ ,  $CH_4$ . It is possible to observe that after the elution of oxygen the valve V3 was switched to ON to allow the elution of  $CO_2$  and at 10 min V3 was switched back to OFF to elute  $N_2$  and  $CH_4$  from molesieve.



TCD (channel B) chromatogram of the gas standard mixture (C5). Labeled peak correspond to:  $H_2$ . All the other compounds of the standard mix are back flushed through Hayasep Q since they are not of interest for this channel and to avoid that they enter in the Molesieve column.



FID chromatogram of the gas standard mixture (C6). Labeled peaks correspond to:  $CH_4$ , ethane, propane, isobutane, *n*-butane, isopentane, *n*-pentane, and *n*-hexane.

## EXPERIMENTAL PARAMETERS

Master GC Analyzer		
Columns	Channel 1	Hayesep Q (2m,1/16",80/100 mesh) Molsieve 5A (2m,1/16",80/100 mesh)
	Channel 2	Hayesep Q (2m,1/16",80/100 mesh) Molsieve 5A (2m,1/16",80/100 mesh)
	Channel 3	Alumina (1m,1/16",80/100 mesh)
GC Oven		
Temperature	32°C (for 10 min), 50°C/min to 150°C (for 20 min)	
Injector A : PK		
Temperature	40°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	6 ml/min	
Injector B : PK		
Temperature	40°C	
Carrier Gas	Nitrogen	
Maximum Pressure	n/a	
Flow	8 ml/min	
Injector C: SL/IN		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:10	
Flow	12 ml/min	
Detector A : TCD Channel 1		
Temperature	150°C	
Main filament temp.	220°C	
Main filament safety	Injector A	
Min Half-Peak Width	1s	
Digital Acquisition Rate	10 Hz	
Signal zeroing	50 mV	
Detector B : TCD Channel 2		
Temperature	150°C	
Main Filament Temp.	220°C	
Main Filament Safety	Injector B	
Min. Half-Peak Width	1s	
Digital Acquisition Rate	10 Hz	
Signal Zeroing	50 mV	
Detector C: FID		
Temperature	150°C	
AUX Flow	25 ml/min	
$H_2$ Flow	40 ml/min	
Air Flow	280 ml/min	
Auxiliary Pressure		
AUX 1 Pressure	1.5 bar	
AUX 2 Pressure	2.2 bar	
Auxiliary Temperature		
Aux temp - Aux oven temp	80°C	



# NATURAL GAS ANALYSIS

## DGA-008

### Natural Gas Analyzer for Hydrocarbons and CO CO<sub>2</sub>

The DGA-008 Analyzer enables the analysis of hydrocarbons which is performed using a Split Splitless (SL/IN) injector, capillary columns and an FID detector.

This MASTER GC Analyzer also fulfils the need of an accurate and effective determination of CO and CO<sub>2</sub> at ppm level. For this purpose the MASTER GC Analyzer includes a second channel that is equipped with a packed (PK) injector, packed columns and an FID detector.

On this channel a Methanizer is present to allow the determination of CO and CO<sub>2</sub> using the FID detector.

Moreover, the gas chromatograph is configured with three valves: two 6-port valves and an 8-port valve located in the GC auxiliary oven.

DANI DGA-008 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Hydrocarbons and CO CO<sub>2</sub>

## Master DGA-008

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CO, CH<sub>4</sub>, ethane, propane, butane, iso-butane, pentane, iso-pentane, and C<sub>6+</sub> (hexane and higher hydrocarbons)

#### OFFICIAL METHODS MET:

UOP 603, ASTM 2505

#### KEY FEATURES & BENEFITS:

Accurate and effective determination of CO and CO<sub>2</sub> at ppm levels;

Reliable and precise detection and determination of hydrocarbons up to C<sub>6+</sub>;

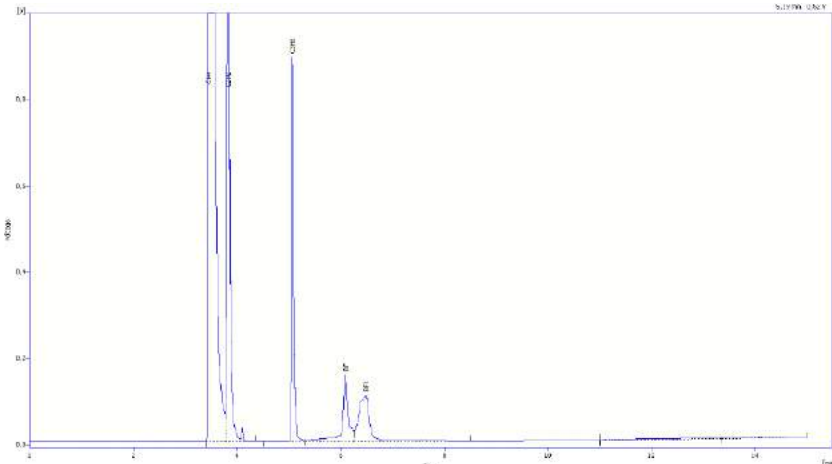
Channel A is dedicated to the analysis of hydrocarbons and includes two 6-port valves and one FID detector. A valve and an auxiliary gas system allow to backflush the heavier hydrocarbons;

A 50 m Retention Gap (0.53 mm) and an adjustable restrictor on Channel A balance the flow and permit to backflush;

CO and CO<sub>2</sub> analysis is performed through Channel B equipped with a 8-port valve, the Methanizer and a FID detector;

A valve and an auxiliary gas system on Channel B allow to backflush the hydrocarbons (except methane);

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



**Hydrocarbons Analysis.**

FID A chromatogram of the hydrocarbons standard mixture.

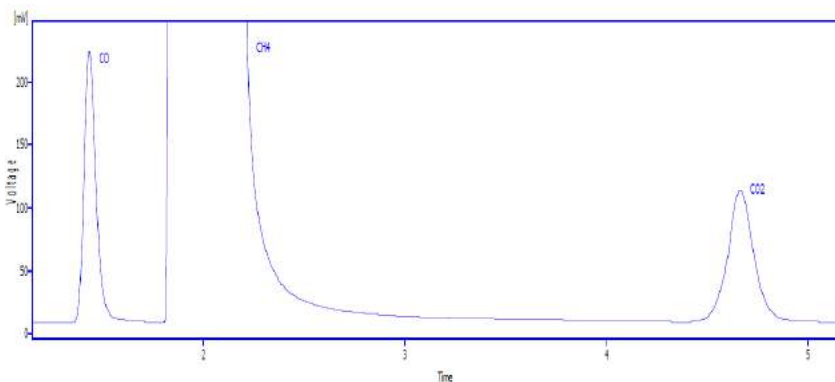
It is possible to see the peaks of CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>; the heavier hydrocarbons of the standard mix are back flushed and they reach the detector not separated (marked with BF and BF1).

**EXPERIMENTAL PARAMETERS FOR HYDROCARBON ANALYSIS**

Master GC Analyzer	
Columns	Channel A WCOT CP SII (30m, 0.32 mm, 3µm) Plot Al203/Na2S04 (50m, 0.32mm, 5µm)
GC Oven	
Temperature	32°C (for 10 min), 50°C/min to 150° C (for 20 min)
Injector A: SL/IN	
Temperature	200°C
Carrier Gas	Helium
Split Ratio	1:10
Flow	6 ml/min
Injector B : PK	
Temperature	40°C
Carrier Gas	Helium
Maximum Pressure	n/a
Flow	1 ml/min
Detector A : FID A Channel 1	
Temperature	280°C
Aux A Flow (N <sub>2</sub> )	26 ml/min
H <sub>2</sub> Flow	45 ml/min
Air Flow	272 ml/min
Auxiliary Pressure	
AUX 1 Pressure (He)	3 bar
AUX 2 Pressure	2.2 bar
Auxiliary Temperature	
Aux temp - Aux oven temp	150°C

**EXPERIMENTAL PARAMETERS FOR CO AND CO<sub>2</sub> ANALYSIS**

Master GC Analyzer	
Columns	Channel B Hayesep R (2.5m, 1/8", 80/100 mesh) Hayesep R (1m, 1/8", 80/100 mesh)
GC Oven	
Temperature	at 1 min -40°C to 120°C at 200°C/min and 120 to 200 at 50°C/min for 15 min
Injector C: PK	
Temperature	40°C
Carrier Gas	Helium
Maximum Pressure	2 bar
Flow	20 ml/min
Detector B : Channel B	
Temperature	280°C
Aux C Flow (N <sub>2</sub> )	25 ml/min
H <sub>2</sub> Flow	40 ml/min
Air Flow	280 ml/min
Auxiliary Pressure	
AUX Gas 2	1 bar
AUX Gas 3	0.1 bar
Auxiliary Temperature	
Aux temp 1 - Aux oven temp	n/a
Aux temp 2 - Methanizer	380°C



FID B chromatogram of the CO and CO<sub>2</sub> standard mixture. It is possible to see the peaks of CO, CH<sub>4</sub>, CO<sub>2</sub>.

# NATURAL GAS ANALYSIS

## DGA-009

### Natural Gas Analyzer for CO, CO<sub>2</sub> and Hydrocarbons

DGA-009 is a dual-channel system for the simultaneous and proper separation and analysis of CO, CO<sub>2</sub> and Hydrocarbons. Hydrocarbon analysis is performed using a Packed Injector (PK), packed columns and a Flame Ionization Detector (FID). A second channel is equipped with a Packed Injector (PK), packed columns and a Flame Ionization Detector (FID); a Methanizer is present on this channel for the determination of CO and CO<sub>2</sub>. The system is configured with one 8-port valve located in the GC auxiliary oven, used for sampling CO and CO<sub>2</sub> on channel A.

DANI DGA-009 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Hydrocarbons and CO CO<sub>2</sub>

## Master DGA-009

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

Hydrocarbons from C<sub>14</sub> to C<sub>16</sub>, CO, and CO<sub>2</sub>.

#### OFFICIAL METHODS MET:

UOP 603

#### KEY FEATURES & BENEFITS:

Accurate and effective determination of CO and CO<sub>2</sub> at ppm levels;

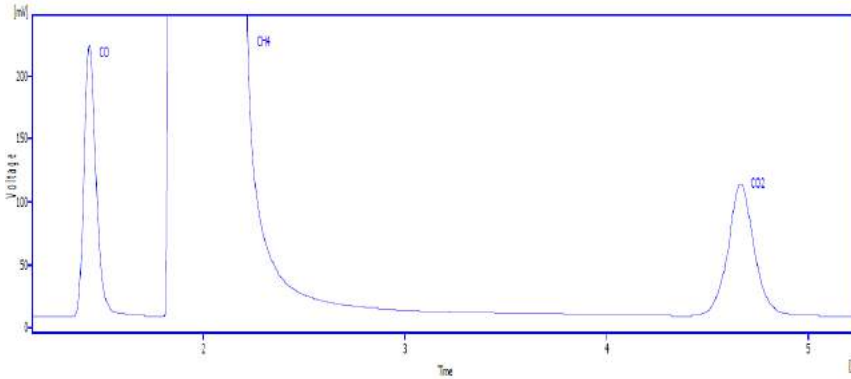
Reliable and precise detection and determination of hydrocarbons from C<sub>14</sub> to C<sub>16</sub>;

Channel A is dedicated to the analysis of CO and CO<sub>2</sub> and it's equipped with a 8-port valve, the Methanizer and an FID Detector;

The Methanizer enables the FID to detect low levels of CO and CO<sub>2</sub>;

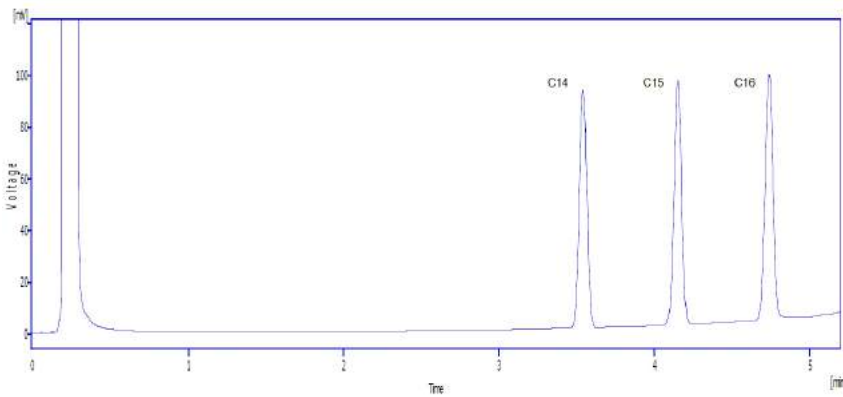
Hydrocarbon analysis is performed through channel C that includes a PK injector, a capillary column and an FID detector;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



CO and CO<sub>2</sub> analysis.  
FID A chromatogram of the CO and CO<sub>2</sub> standard mixture. It is possible to see the peaks of CO, CH<sub>4</sub>, CO<sub>2</sub>.

EXPERIMENTAL PARAMETERS FOR CO AND CO <sub>2</sub> ANALYSIS		
<b>Master GC Analyzer</b>		
Columns	Channel A	Hayesep R (2.5m, 1/8", 80/100 mesh) Hayesep R (1m, 1/8", 80/100 mesh)
<b>GC Oven</b>		
Temperature	at 5 min -35°C to 200°C at 20°C/min for 10 min	
<b>Injector A: PK</b>		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	2 bar	
Flow	20 ml/min	
<b>Detector A: Channel A</b>		
Temperature	280°C	
Aux C Flow (N <sub>2</sub> )	25 ml/min	
H <sub>2</sub> Flow	40 ml/min	
Air Flow	280 ml/min	
<b>Auxiliary Pressure</b>		
AUX Gas 2	1.3 bar	
AUX Gas 3	0.1 bar	
<b>Auxiliary Temperature</b>		
Aux temp 1 - Aux oven temp	80°C	
Aux temp 2 - Methanizer	380°C	



Hydrocarbons Analysis.  
FID chromatogram of the Hydrocarbons standard mixture. It is possible to recognize the solvent peak, hexane, and the three compounds of the standard mixture: tetradecane, pentadecane and hexadecane.

EXPERIMENTAL PARAMETERS FOR HYDROCARBON ANALYSIS		
<b>Master GC Analyzer</b>		
Columns	Channel C	EC-1 (10m, 0.53mm, 2.65µm)
<b>GC Oven</b>		
Temperature	at 1 min 100°C to 210°C at 20°C/min	
<b>Injector B: PK</b>		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	20 ml/min	
<b>Detector C: FID C</b>		
Temperature	280°C	
Aux A Flow (N <sub>2</sub> )	25 ml/min	
H <sub>2</sub> Flow	40 ml/min	
Air Flow	280 ml/min	
<b>Auxiliary Temperature</b>		
Aux temp 1 - Aux oven temp	80°C	

# NATURAL GAS ANALYSIS

## DGA-010

### Natural Gas Analyzer for Hydrogen and Helium

The DGA-010 Analyzer enables the analysis of hydrogen and helium in a gas mixture which is performed using a Packed (PK) injector, micro-packed columns and a  $\mu$ TCD detector.

The instrument is equipped with two identical channels with this same configuration.

Moreover, the gas chromatograph is configured with two 8-port valves located in the GC auxiliary oven and a backflush system.

DANI DGA-010 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Hydrogen and Helium

*Master* **DGA-010**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

H<sub>2</sub> and He

#### OFFICIAL METHODS MET:

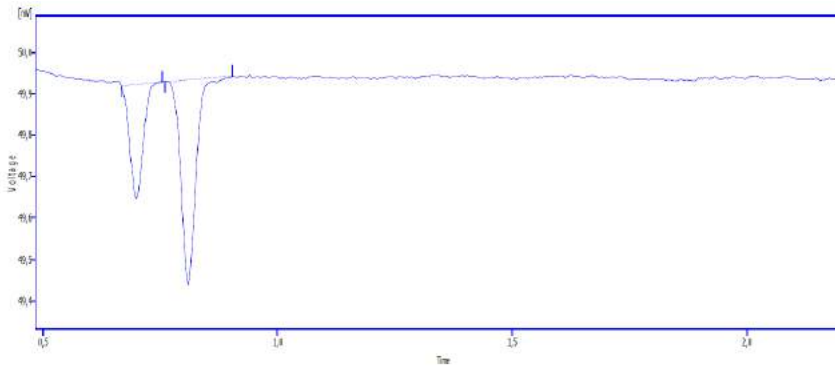
ASTM 2504

#### KEY FEATURES & BENEFITS:

With the DGA-010 Analyzer it is possible to determine Hydrogen and Helium in a hydrocarbon mixture and separate them from the hydrocarbons using a backflush;

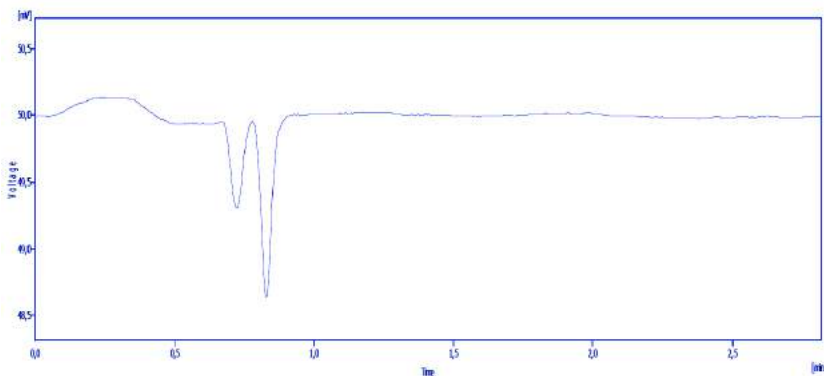
Valve system configuration and their default positions of switching are factory set up;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



µTCD channel A chromatogram of the Gas standard mixture. It is possible to see the peaks of Helium and H2.

EXPERIMENTAL PARAMETERS FOR H <sub>2</sub> AND HE ANALYSIS CHANNEL A	
<b>Master GC Analyzer</b>	
Columns	Channel A Hayesep Q (1m, 1mm ID, 1/16", 100/120 mesh) Molsieve (2m, 1mm ID, 1/16", 80/100 mesh)
<b>GC Oven</b>	
Temperature	at 3 min -33°C to 60°C at 20°C/min for 5 min
<b>Injector A: PK</b>	
Temperature	200°C
Carrier Gas	Helium
Maximum Pressure	n/a
Flow	15 ml/min
<b>Detector A : µTCD</b>	
Temperature	150°C
Filament Temperature	210°C
Signal Zeroing	50 mV
Filament Safety	Injector A
<b>Auxiliary Pressure</b>	
AUX 1 Pressure	2.7 bar
<b>Auxiliary Temperature</b>	
Aux temp 1 - Aux oven temp	80°C



µTCD channel B chromatogram of the Gas standard mixture. It is possible to see the peaks of Helium and H2.

EXPERIMENTAL PARAMETERS FOR H <sub>2</sub> AND HE ANALYSIS CHANNEL B	
<b>Master GC Analyzer</b>	
Columns	Channel B Hayesep Q (1m, 1mm ID, 1/16", 100/120 mesh) Molsieve (2m, 1mm ID, 1/16", 80/100 mesh)
<b>GC Oven</b>	
Temperature	at 3 min -33°C to 60°C at 20°C/min for 5 min
<b>Injector B: PK</b>	
Temperature	200°C
Carrier Gas	Helium
Maximum Pressure	n/a
Flow	15 ml/min
<b>Detector B : µTCD</b>	
Temperature	150°C
Filament Temperature	210°C
Signal Zeroing	50 mV
Filament Safety	Injector B
<b>Auxiliary Pressure</b>	
AUX 1 Pressure	4 bar
<b>Auxiliary Temperature</b>	
Aux temp 1 - Aux oven temp	80°C

# NATURAL GAS ANALYSIS

## DGA-011

### Natural Gas Analyzer for Natural Gas with Permanent Gas Separation

The DGA-011 Analyzer enables the analysis of permanent gases in natural gas which is performed using a Packed injector, micro-packed columns and a  $\mu$ TCD detector. Moreover, the gas chromatograph is configured with two valves for gas sampling and switching: an 8-port valve and a 6-port valve located in the GC auxiliary oven.

DANI DGA-011 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gases in Natural Gas

*Master* **DGA-011**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>, CO<sub>2</sub>, C<sub>2</sub> and higher hydrocarbons

#### OFFICIAL METHODS MET:

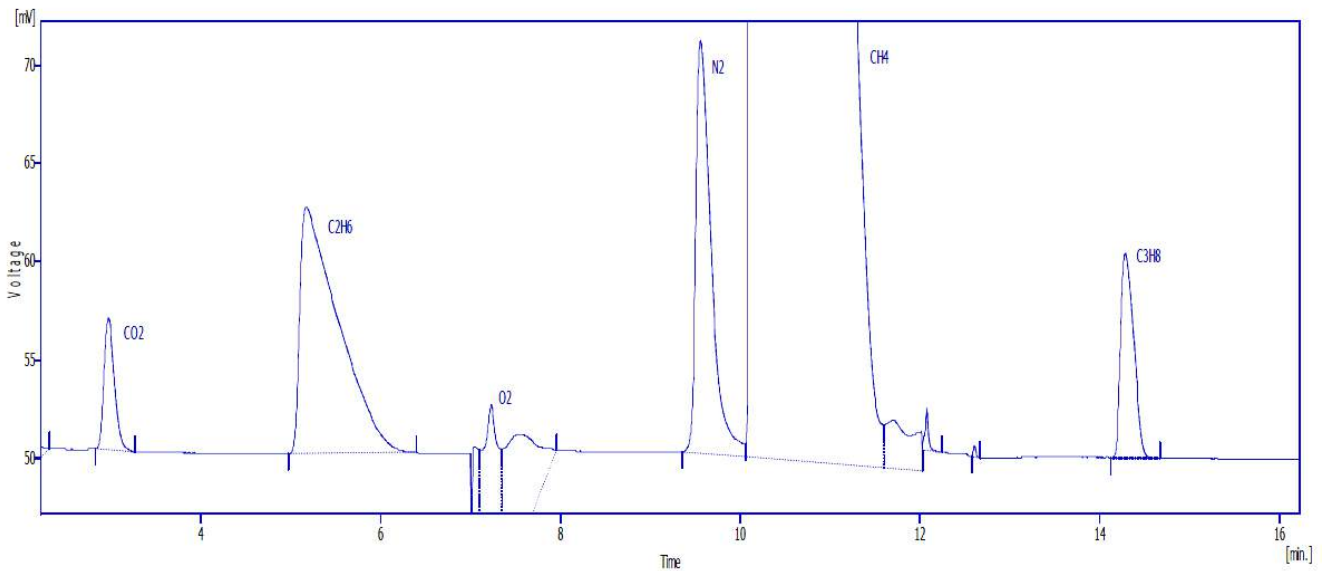
ASTM 1945, ASTM 1946

#### KEY FEATURES & BENEFITS:

Speed, reduced dead volumes, and precision are guaranteed by the use of the  $\mu$ TCD detector;

Valve system configuration and their default positions of switching are factory set up;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



uTCD chromatogram of the gas standard mixture. It is possible to recognize the peaks of CO<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, C<sub>3</sub>H<sub>8</sub>

EXPERIMENTAL PARAMETERS		
<b>Master GC Analyzer</b>		
Columns	Channel A	Hayesep T (1m, 1/16", 80/100 mesh) Hayesep Q (1m, 1/16", 100/120 mesh) Molsieve 5A (2m, 1/16", 80/100 mesh)
<b>GC Oven</b>		
Temperature	at 10 min - 32°C to 150°C at 20°C/min - 150°C for 15 min	
<b>Injector A: PK</b>		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	27 ml/min	
<b>Detector A : μTCD</b>		
Temperature	150°C	
Filament Temperature	210°C	
Signal Zeroing	50 mV	
Filament Safety	Injector A	
<b>Auxiliary Pressure</b>		
AUX 1 Pressure	3.7 bar	
<b>Auxiliary Temperature</b>		
Aux temp 1 - Aux oven temp	80°C	



# NATURAL GAS ANALYSIS

## DGA-012

### Natural Gas Analyzer for Hydrocarbons

The DGA-012 Analyzer is a two-channel system.

The first channel is equipped with a Packed Injector (PK), a wide bore capillary column and a Thermal Conductivity Detector (TCD); the second one has a Split Splitless Injector (SL/IN), a capillary column and a Flame Ionization Detector (FID). One 6-port valve is located in the GC auxiliary oven for the gas sample injection on the second channel.

DANI DGA-012 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Hydrocarbons

*Master* **DGA-012**

#### SAMPLE TYPE:

Gas/Liquid

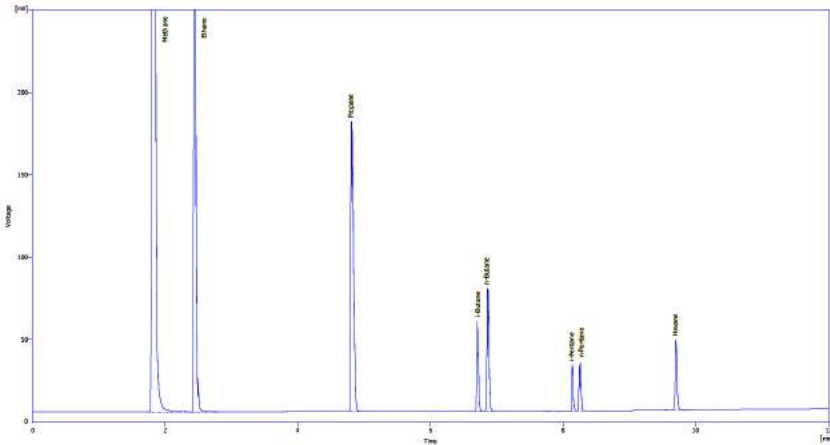
#### TYPICAL DETECTED COMPOUNDS:

#### OFFICIAL METHODS MET:

#### KEY FEATURES & BENEFITS:

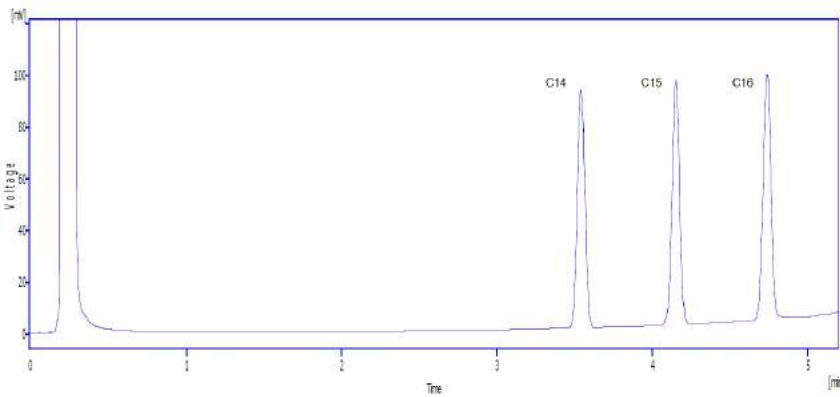
Hydrocarbons analysis is performed using the channel A that includes the PK injector, a capillary column and the TCD detector;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



TCD chromatogram of the hydrocarbons standard mixture. It is possible to see the peaks of decane, undecane, dodecane. Hexane is the solvent of the standard mixture.

EXPERIMENTAL PARAMETERS - CHANNEL A	
<b>Master GC Analyzer</b>	
Columns	Channel A EC-1 (10m, 0.53mm, 2.65µm)
<b>GC Oven</b>	
Temperature	at 1 min -90°C to 180°C at 20°C
<b>Injector A: PK</b>	
Temperature	300°C
Carrier Gas	Helium
Maximum Pressure	n/a
Flow	12 ml/min
<b>Detector A : TCD</b>	
Temperature	250°C
Voltage	6 volt
Polarity	Negative
Max Current	180 mA
Main Filament Safety	Injector A
Second Filament Safety	Aux Gas 2
<b>Auxiliary Pressure</b>	
AUX 1 Pressure	0 bar
Aux 2 Pressure	0.6 bar



Hydrocarbons Analysis.  
FID chromatogram of the Hydrocarbons standard mixture. It is possible to recognize the solvent peak, hexane, and the three compounds of the standard mixture: tetradecane, pentadecane and hexadecane.

EXPERIMENTAL PARAMETERS - CHANNEL C	
<b>Master GC Analyzer</b>	
Columns	Channel C EC-1 (10m, 0.53mm, 2.65µm)
<b>GC Oven</b>	
Temperature	at 5 min -36°C to 200°C at 50°C/min
<b>Injector B: SL/IN</b>	
Temperature	200°C
Carrier Gas	Helium
Split Ratio	1:100
Flow	1 ml/min
<b>Detector C : FID</b>	
Temperature	280°C
Aux C flow (N <sub>2</sub> )	25 ml/min
H <sub>2</sub> flow	40 ml/min
Air Flow	280 ml/min
<b>Auxiliary Temperature</b>	
Aux temp 1 - Aux oven temp	80°C

# NATURAL GAS ANALYSIS

## DGA-013

### Natural Gas Analyzer for CO, CO<sub>2</sub> and Hydrocarbons

The DGA-013 Analyzer is a dual-channel system for the analysis of hydrocarbons and CO, CO<sub>2</sub>. The analysis of hydrocarbons is performed using a packed injector (PK), capillary columns and a Flame Ionization Detector (FID).

For the analysis of CO and CO<sub>2</sub>, the Analyzer includes a second channel equipped with a packed injector (PK), packed columns and a Flame Ionization Detector (FID). On this second channel a Methanizer is present to allow the determination of CO and CO<sub>2</sub> using the FID detector.

DANI DGA-013 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of CO, CO<sub>2</sub> and Hydrocarbons

*Master* **DGA-013**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

CO, CO<sub>2</sub> at ppm levels and hydrocarbons

#### OFFICIAL METHODS MET:

UOP 603, ASTM 2505

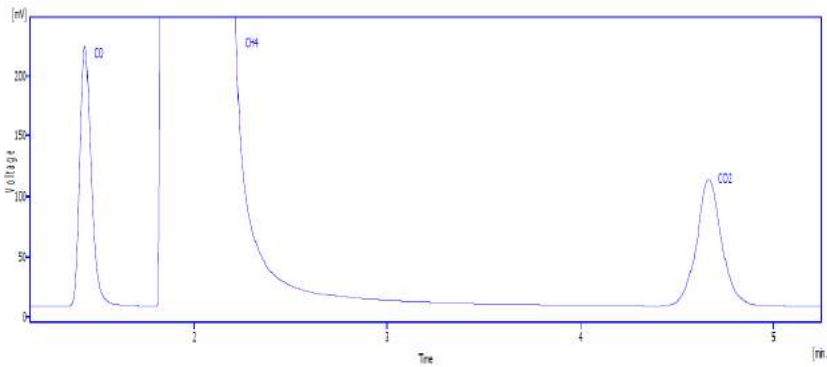
#### KEY FEATURES & BENEFITS:

The DGA-013 Analyzer can determine CO and CO<sub>2</sub> in a hydrocarbon mixture and separate the components from C<sub>2</sub> using a backflush on Channel A;

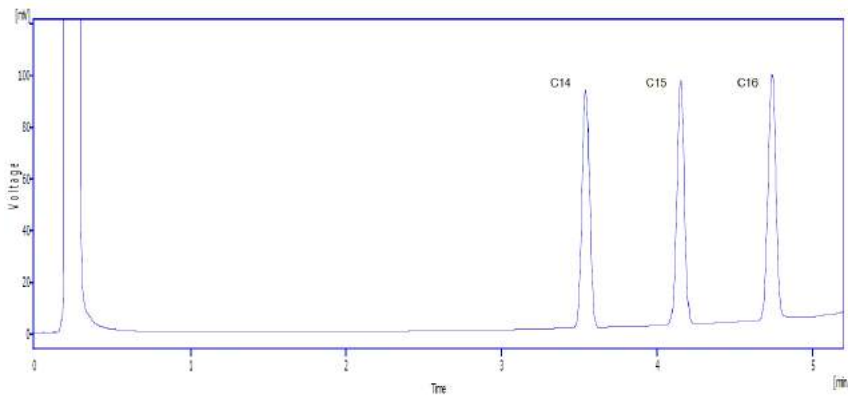
A solenoid valve and an auxiliary gas system allow to backflush the hydrocarbons (except methane);

Hydrocarbon analysis is performed using the Channel C that includes a 6-port valve, a PK Injector, a capillary column and the FID detector;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



FID B chromatogram of the CO and CO<sub>2</sub> standard mixture. It is possible to see the peaks of CO, CH<sub>4</sub>, CO<sub>2</sub>.



Hydrocarbons Analysis.  
FID chromatogram of the Hydrocarbons standard mixture. It is possible to recognize the solvent peak, hexane, and the three compounds of the standard mixture: tetradecane, pentadecane and hexadecane.

### EXPERIMENTAL PARAMETERS FOR CO AND CO<sub>2</sub> ANALYSIS CHANNEL A

Master GC Analyzer		
Columns	Channel A	Hayesep R (2.5m, 1/8", 80/100 mesh) Hayesep R (1m, 1/8", 80/100 mesh)
GC Oven		
Temperature	at 10 min 35°C to 200°C at 20°C/min for 10 min	
Injector A: PK		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	2 bar	
Flow	20 ml/min	
Detector A : channel A		
Temperature	350°C	
Aux C flow (N <sub>2</sub> )	25 ml/min	
H <sub>2</sub> flow	40 ml/min	
Air flow	280 ml/min	
Auxiliary Temperature		
Aux Temp 1 - Aux Oven Temp	80°C	
Aux Temp 2 - Aux Oven Temp	380°	
Auxiliary Pressure		
AUX Gas 1	1.8 bar	
Aux Gas 2	0.1 bar	

### EXPERIMENTAL PARAMETERS FOR HYDROCARBONS ANALYSIS CHANNEL C

Master GC Analyzer		
Columns	Channel C	EC-1 (10m, 0.53mm, 2.65µm)
GC Oven		
Temperature	35°C for 6 min	
Injector B: PK		
Temperature	40°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	5 ml/min	
Detector C : FID C		
Temperature	300°C	
Aux A flow (N <sub>2</sub> )	25 ml/min	
H <sub>2</sub> flow	40 ml/min	
Air Flow	280 ml/min	
Auxiliary Temperature		
Aux temp 1 - Aux oven temp	80°C	

# NATURAL GAS ANALYSIS

## DGA-014

### Natural Gas Analyzer for NGA with Permanent Gas Separation - H<sub>2</sub> and He

The the DGA-014 Analyzer is a dual-channel system for the analysis of Permanent Gases, Hydrogen and Helium. The first one, for permanent gas analysis, is configured with a packed injector (PK), micro-packed columns and a Micro Thermal Conductivity Detector ( $\mu$ TCD). The analysis of Hydrogen in a gas mixture, on the second channel, is performed by a Packed Injector (PK), micro-packed column and the Micro Thermal Conductivity Detector ( $\mu$ TCD).

DANI DGA-014 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and He.

*Master* **DGA-014**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

CO, CO<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>, N<sub>2</sub>, He, Hydrocarbons

#### OFFICIAL METHODS MET:

ASTM 1945, ASTM 1946, GPA 2177, ASTM 2504

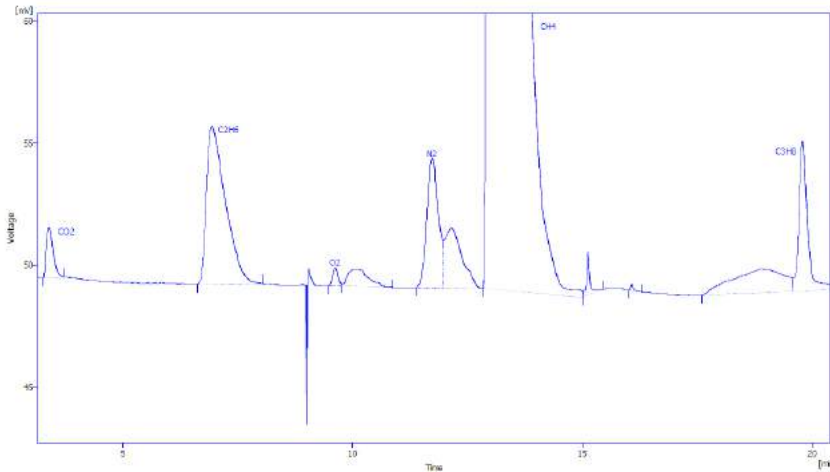
#### KEY FEATURES & BENEFITS:

With the DGA-014 it is possible to determine O<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>, CO<sub>2</sub>, C<sub>2</sub> and higher hydrocarbons in Natural Gas Samples and separate the components above C<sub>3</sub> using a backflush;

The use of an optimized combination of columns allows the excellent separation of all the components and more reproducible characteristics;

The  $\mu$ TCD detector guarantees linear dynamic range, speed, reduced dead volumes and precision;

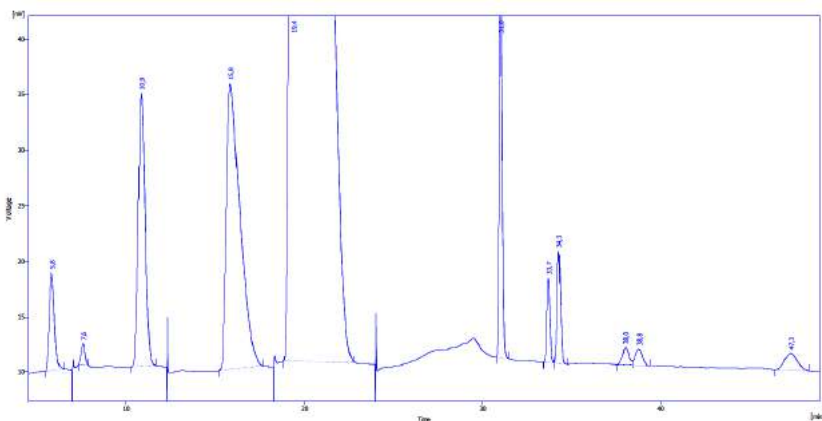
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



uTCD A chromatogram of the Hydrocarbons standard mixture. It is possible to recognize the peaks of CO<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, C<sub>3</sub>H<sub>8</sub>

**EXPERIMENTAL PARAMETERS FOR NATURAL GAS ANALYSIS CHANNEL A**

Master GC Analyzer		
Columns	Channel A	Hayesep T (1m, 1/16", 80/100 mesh) Hayesep Q (1m, 1/16", 100/120 mesh) Molsieve 5A (2m, 1/16, 80/100 mesh)
GC Oven		
Temperature	at 15 min 33°C to 150°C at 20°C/min for 10 min	
Injector A: PK		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	15 ml/min	
Detector A : μTCD		
Temperature	150°C	
Filament Temp	210°C	
Signal Zeroing	50 mV	
Filament Safety	Injector A	
Auxiliary Temperature		
Aux Temp 1 - Aux Oven Temp	80°C	
Auxiliary Pressure		
AUX Gas 1	3.2 bar	



TCD chromatogram of the gas standard mixture (C6). Peaks correspond to: CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, ethane, CH<sub>4</sub>, propane, isobutane, n-butane, isopentane, npentane, hexane.

**EXPERIMENTAL PARAMETERS FOR H<sub>2</sub> AND HE ANALYSIS CHANNEL B**

Master GC Analyzer		
Columns	Channel B	Hayesep Q (1m, 1mm ID, 1/16", 100/120 mesh) Molsieve (2m, 1mm ID 1/16", 80/100 mesh)
GC Oven		
Temperature	at 4 min 33°C to 150°C at 20°C/min for 10 min	
Injector B: PK		
Temperature	200°C	
Carrier Gas	Helium	
Maximum Pressure	n/a	
Flow	17.2 ml/min	
Detector B : μTCD		
Temperature	150°C	
Filament Temperature	210°C	
Signal Zeroing	50mV	
Filament Safety	Injector B	
Auxiliary Temperature		
Aux temp 1 - Aux oven temp	80°C	
Auxiliary Pressure		
AUX 3 Pressure	3 bar	

# NATURAL GAS ANALYSIS

## DGA-016

### Natural Gas Analyzer for NGA for Permanent Gas and H<sub>2</sub>S

The DGA-016 analyzer enables the analysis of permanent gases and other compounds which is performed using a split/split-less injector (SL/IN), capillary columns and a micro thermal conductivity detector ( $\mu$ TCD). The GC oven is equipped with a cryogenic system that allows oven temperature to go below zero.

DANI DGA-016 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and He.

*Master* **DGA-016**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

H<sub>2</sub>, Ar, O<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>, CO, CO<sub>2</sub>, C<sub>2</sub>, H<sub>2</sub>S

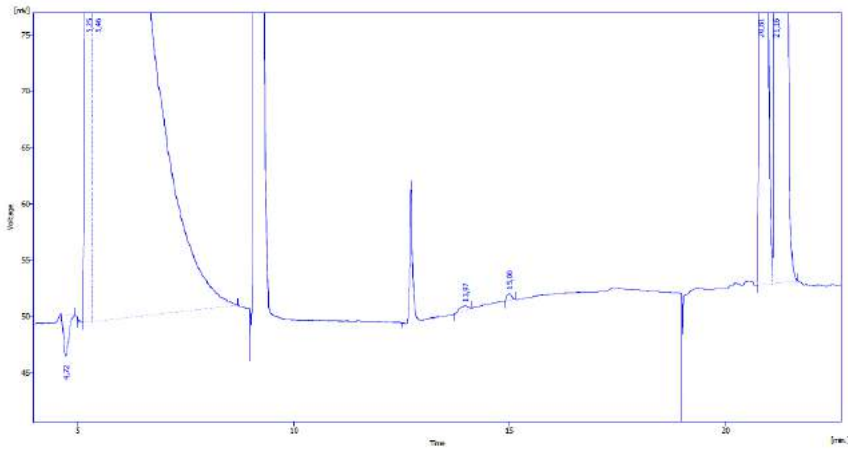
#### KEY FEATURES & BENEFITS:

With the DGA-016 Analyzer it is possible to determine H<sub>2</sub>, Ar, O<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>, CO, CO<sub>2</sub>, C<sub>2</sub>, and H<sub>2</sub>S in a gas mixture and to separate these compounds using a switch valve and a molsieve column;

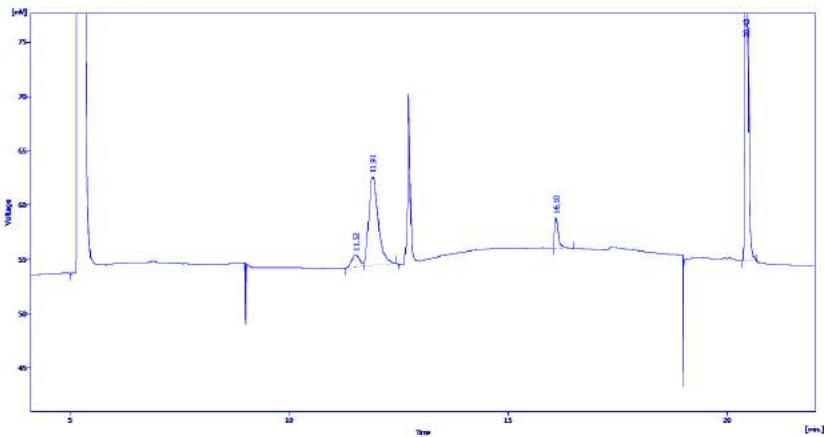
High separation power and high retention for permanent gases are guaranteed by the optimized choice of columns;

The cryogenic system assures improved resolution and better detection limits;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



uTCD chromatogram of the Gas standard mixture 1. It is possible to recognize the peaks of H<sub>2</sub>, CO<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, N<sub>2</sub>, CO



uTCD chromatogram of the Gas standard mixture 2. It is possible to recognize the peaks of Ar, O<sub>2</sub>, H<sub>2</sub>S, N<sub>2</sub>

**EXPERIMENTAL PARAMETERS FOR PERMANENT GAS AND H<sub>2</sub>S DETERMINATION**

Master GC Analyzer		
Columns	Channel A	Poraplot Q (25m, 0.32 mm ID, 30 µm) Molsieve 5A (25m, 0.32 mm ID, 10 µm)
GC Oven		
Temperature	at 12.5 min from -20°C to 36°C at 50°C/min after 1 min from 36°C to 200°C at 20°C/min for 10 min	
Cryo Threshold	32°C	
Injector B: SL/IN		
Temperature	200°C	
Carrier Gas	Helium	
Split Flow	Splitless	
Flow	8 ml/min	
Detector A : µTCD		
Temperature	150°C	
Filament Temperature	210°C	
Signal Zeroing	50mV	
Filament Safety	Injector B	
Auxiliary Temperature		
Aux temp 1 - Aux oven temp	90°C	



# NATURAL GAS ANALYSIS

## DGA-017

### Natural Gas Analyzer for Natural Gas Analysis

The Natural Gas Analysis is performed using a packed injector (PK), packed Columns and a Thermal Conductivity Detector (TCD).

A 6-port valve is used to bypass the compounds that would not be released by the molsieve column.

DANI DGA-017 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Natural Gas

*Master* **DGA-017**

#### **SAMPLE TYPE:**

Gas

#### **TYPICAL DETECTED COMPOUNDS:**

O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, ethane, propane, *n*-butane, isobutane, *n*-pentane, isopentane, and hexane.

#### **OFFICIAL METHODS MET:**

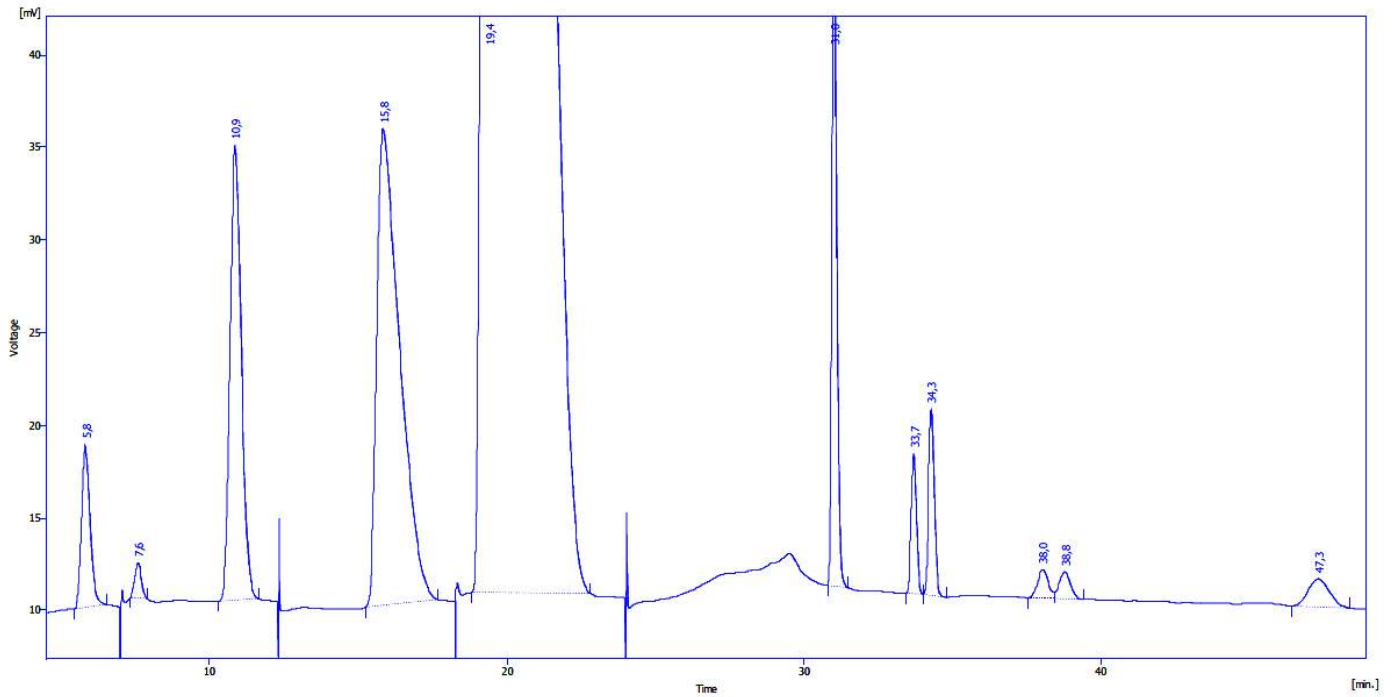
ASTM 1945, ASTM 1946, GPA 2177

#### **KEY FEATURES & BENEFITS:**

DGA-017 Analyzer is optimized for a reliable and precise detection and determination of permanent gases and hydrocarbons up to C<sub>6</sub>;

The TCD detector is an easy-to-use and low cost choice for the detection of the required compounds;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



TCD chromatogram of the gas standard mixture (C6).  
 Peaks correspond to: CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, ethane, CH<sub>4</sub>, propane, isobutane, n-butane, isopentane, npentane, hexane.

EXPERIMENTAL PARAMETERS		
<b>Master GC Analyzer</b>		
Columns	Channel A	<b>Hayesep Q</b> (2m, 2 mm ID, 4mm OD, 80/100 mesh) <b>Molsieve 5A</b> (25m, 2 mm ID, 4mm OD, 80/100 mesh)
<b>GC Oven</b>		
Temperature	at 24 min 40°C to 200°C at 20°C/min for 20 min	
<b>Injector B: PK</b>		
Temperature	200°C	
Carrier Gas	Helium	
Max Pressure	2 bar	
Flow	10 ml/min	
<b>Detector A : TCD</b>		
Temperature	250°C	
Volatage	7 V	
Polarity	Negative	
Max Current	180 mA	
Filament Safety	Injector B	
Filament Safety	Aux Gas 1	
<b>Aux Gas</b>		
Aux Gas 1	0.4 bar	

# NATURAL GAS ANALYSIS

## DGA-018

### DANI Gas Analyzer for Hydrocarbons and Sulfur Compounds

The analysis with the DGA-018 Analyzer is performed using a split/ splitless (SLIN) injector, micro-packed columns and a micro thermal conductivity detector (mTCD) the instrument is equipped also with a FID detector that can be used for the hydrocarbons analysis.

The channel A of the instruments is equipped with a SL/IN injector and an FPD detector that have not been used in this instrument setup.

Moreover, the gas chromatograph is configured with two valves: an internal 10 port valve for gas samples injection and a side-mounted 4-port valve for liquid samples injection.

DANI DGA-018 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Hydrocarbons and Sulfur Compounds

**Master DGA-018**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

CH<sub>4</sub>, ethane, propane, *n*-butane, isobutane, *n*-pentane, isopentane and C<sub>6</sub>+ (hexane and higher hydrocarbons);

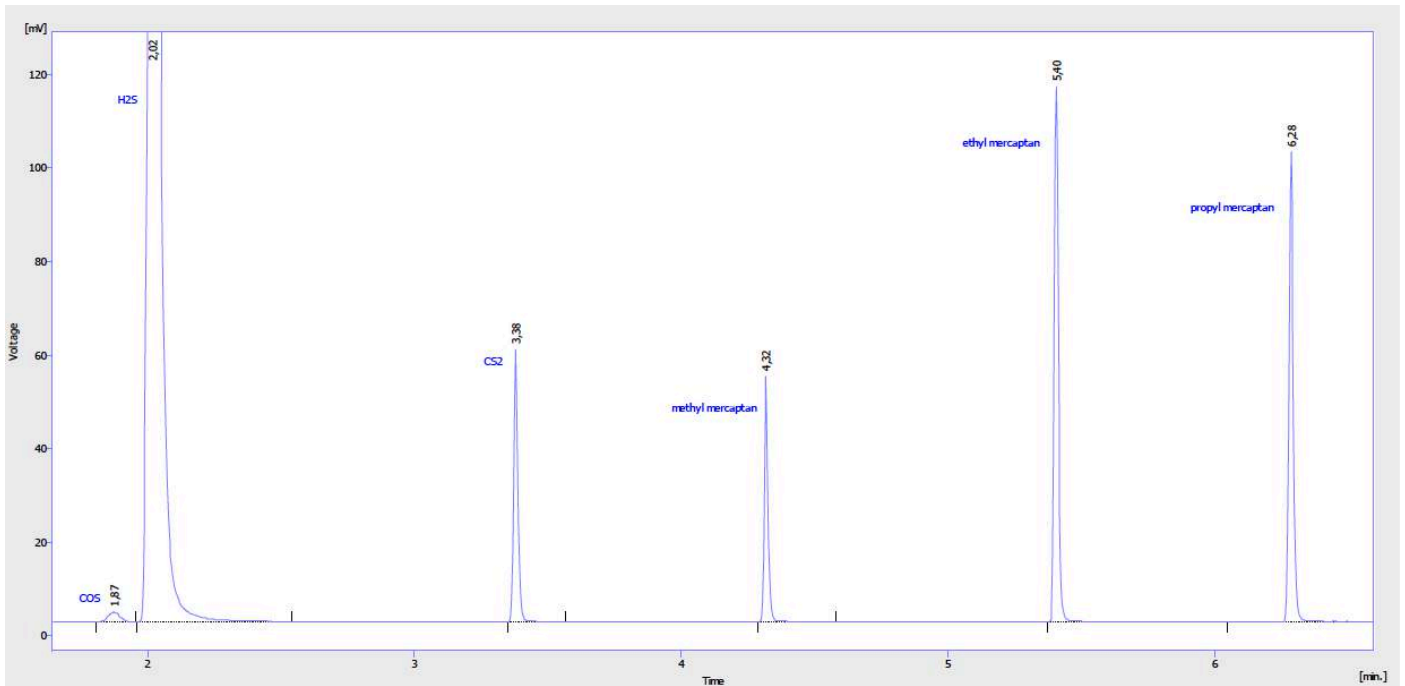
#### KEY FEATURES & BENEFITS:

Analysis of the hydrocarbons is performed using the channel equipped with mTCD detector. The hydrocarbons gas sample is introduced using the 10-port internal valve and carried to the Hayesep Q column by carrier B.

The gas sample is introduced in the system by the 10-port valve equipped with two 1 ml sample loops.

The external valve gives the possibility to introduce liquid samples in the analytical channel;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



mTCD (channel C) chromatogram of the gas standard mixture (C6).  
 Peaks correspond to: O<sub>2</sub> and N<sub>2</sub> (not separated), CH<sub>4</sub>, CO<sub>2</sub>, ethane, propane, isobutane, n-butane, isopentane, n-pentane, hexane.

EXPERIMENTAL PARAMETERS		
<b>Master GC Analyzer</b>		
Columns	Channel A	<b>Hayesep Q</b> (2m, 2 mm ID, 4mm OD, 80/100 mesh) <b>Molsieve 5A</b> (25m, 2 mm ID, 4mm OD, 80/100 mesh)
<b>GC Oven</b>		
Temperature	at 24 min 40°C to 200°C at 20°C/min for 20 min	
<b>Injector B: PK</b>		
Temperature	200°C	
Carrier Gas	Helium	
Max Pressure	2 bar	
Flow	10 ml/min	
<b>Detector A : TCD</b>		
Temperature	250°C	
Volatage	7 V	
Polarity	Negative	
Max Current	180 mA	
Filament Safety	Injector B	
Filament Safety	Aux Gas 1	
<b>Aux Gas</b>		
Aux Gas 1	0.4 bar	

# NATURAL GAS ANALYSIS

## DGA-022

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons and H<sub>2</sub>S Determination

The analysis is performed using a packed Injector (PK), packed columns, a Thermal Conductivity Detector (TCD) with gold plated filmants and a Flame ionization Detector.

One 10-port valve and two 6-port valves are used for the injection and the separation of the compounds.

DANI DGA-022 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons and H<sub>2</sub>S

**Master DGA-022**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, ethane, propane, *iso*-butane, *iso*-pentane, pentane, hexane, H<sub>2</sub>S;

#### OFFICIAL METHODS MET:

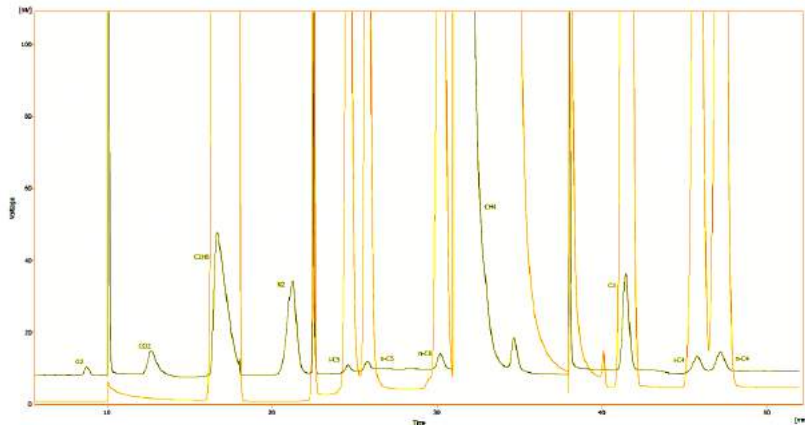
ASTM 1945, ASTM 1946, GPA 2177

#### KEY FEATURES & BENEFITS:

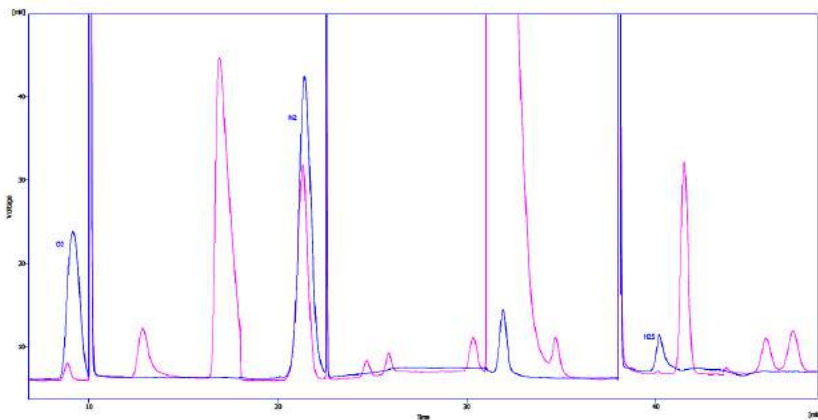
The separation of permanent gases and hydrocarbons is made possible by the presence of packed Molsieve column;

The TCD detector responds to all the pure substances that the FID cannot detect while, on the other hand, the FID, because of its sensitivity, it is the solution of choice for the analysis of hydrocarbons. The combination of the two detectors guarantees an accurate a precise detection of all the components;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



TCD (green) and FID (orange) overlaid chromatograms of the gas standard mixture (C6).  
 Labelled peaks correspond to: O<sub>2</sub>, CO<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, N<sub>2</sub>, i-pentane, n-pentane, hexane, CH<sub>4</sub>, propane, ibutane, n-butane.



TCD chromatograms of the two gas standard mixtures: C6 (purple) and O<sub>2</sub>/H<sub>2</sub>S (blue).  
 Labelled peaks correspond to: O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>S.

EXPERIMENTAL PARAMETERS	
<b>Master GC Analyzer</b>	
Columns	DC 200 (0.3m, 4x3mm (ODxID), 60/80 mesh) DC200 (5m, 4x3mm (ODxID), 60/80 mesh) Porapack N (2m, 4x3m (ODxID), 80/100 mesh) Molsieve 5A (2m, 4x3mm (ODxID), 60/80 mesh) <b>T max oven : 140°C</b>
<b>GC Oven</b>	
Temperature	40°C (for 20 min) then at 20°C/Min to 140°C (for 27 min)
<b>Injector A: PK</b>	
Temperature	250°C
Carrier Gas	Helium
Max Pressure	2 bar
Flow	20 ml/min
<b>Detector C: FID</b>	
Temperature	320°C
Aux Flow (N <sub>2</sub> )	25 ml/min
H <sub>2</sub> Flow	40 ml/min
Air Flow	280 ml/min
<b>Detector A: TCD</b>	
Temperature	200°C
Voltage	6.00 V
Polarity	Negative (-)
Maximum Current	180 mA
Filament Safety	Injector A
Filament Safety Reference	Aux Gas 1
Signal Target	10 mV
<b>Aux Pressure</b>	
Aux 1 Pressure	0.18 bar

# NATURAL GAS ANALYSIS

## DGA-023

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons and CO and CO<sub>2</sub>

The analysis of permanent gas, hydrocarbons, Co and CO<sub>2</sub> is performed using a split splitless injector (SL/IN), capillary columns and a Thermal COnductivity Detector.

The GC is configured with two valves for gas sampling and switching: two 6-port valves are located in the GC oven and on the side of the GC.

Two auxiliary gas currents are installed on the instrument to provide an He current on the two channels of the TCD.

DANI DGA-023 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons, Co and CO<sub>2</sub>

*Master* **DGA-023**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

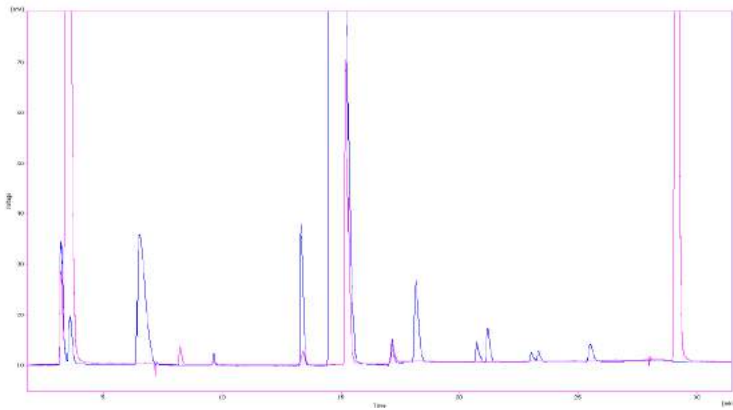
Hydrogen, Oxygen, Nitrogen, Methane, Carbon Monoxide, Carbon Dioxide, and Hydrocarbons up to C<sub>6</sub>;

#### KEY FEATURES & BENEFITS:

Excellent components separation thanks to the Molsieve column (permanent gas) and the Poraplot Q Column (CO<sub>2</sub> and hydrocarbons);

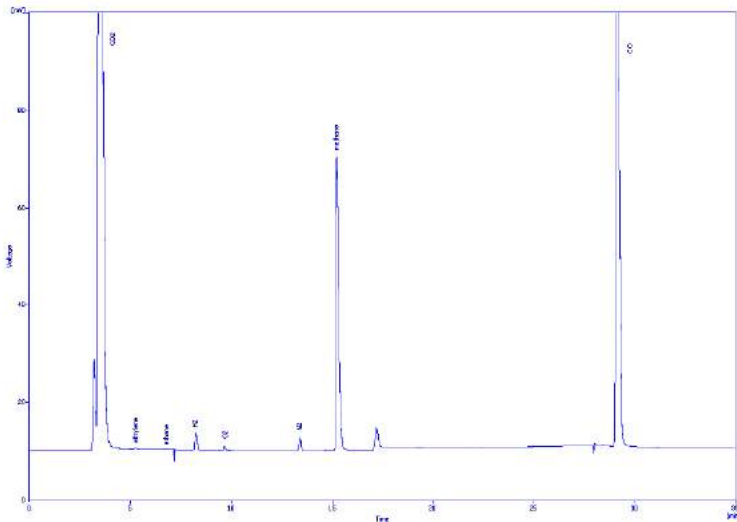
Single TCD channel system : easy-to use, low cost and troubleshoot detector;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;;

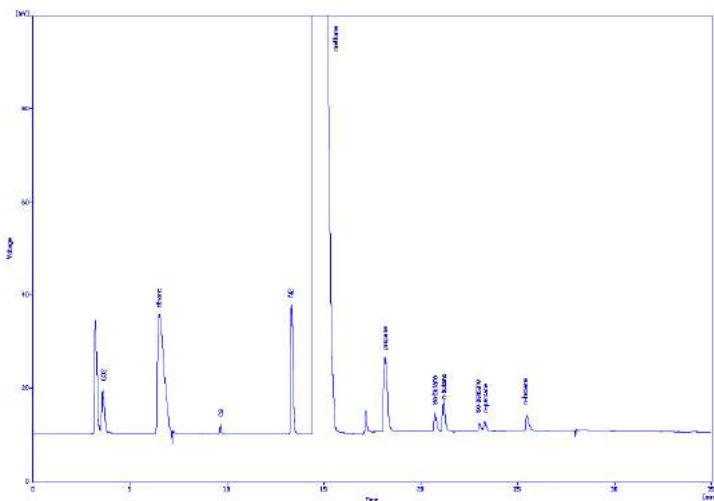


TCD overlaid chromatograms of the two gas standard mixtures (C6 mix displayed with blue line; H<sub>2</sub>, CO and CO<sub>2</sub> mixture with purple line)

EXPERIMENTAL PARAMETERS	
<b>Master GC Analyzer</b>	
Columns	Poraplot Q (25m, 0.53mm ID, 20 μm) Molsieve 5A (25m, 0.53mm ID, 50 μm)  T max oven : 250°C
<b>GC Oven</b>	
Temperature	30°C for 13 min to 220° at 20°C/min for 12.5 min
<b>Injector A: SL/IN</b>	
Temperature	200°C
Carrier Gas	Helium
Inj Mode	Pressure
Inj Press	0.68 bar
Split Ratio	1:1
<b>Detector A: TCD</b>	
Temperature	150°C
Voltage	7 V
Polarity	Negative (-)
Maximum Current	180 mA
Pressure CHN 1	0.25 bar
Pressure CHN 2	0.43 bar



TCD analysis of H<sub>2</sub>, CO and CO<sub>2</sub> concentrated mixture



TCD analysis of C<sub>6</sub> hydrocarbons mixture



# NATURAL GAS ANALYSIS

## DGA-024

### Natural Gas Analyzer for Permanent Gas and Hydrocarbons

The DGA-024 analyzer performs the analyses of permanent gas and hydrocarbons up to C6 by means of two split/splitless Injectors (SL/IN), three capillary Columns, a Flame Ionization Detector (FID) and a Micro Thermal Conductivity Detector ( $\mu$ TCD).

One 10-port valve for sampling and two six-port valves for switching are located in the GC auxiliary oven.

DANI DGA-024 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas and Hydrocarbons

**Master DGA-024**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, ethane, propane, *n*-butane, *n*-pentane, *i*-pentane, and hexane;

#### OFFICIAL METHODS MET:

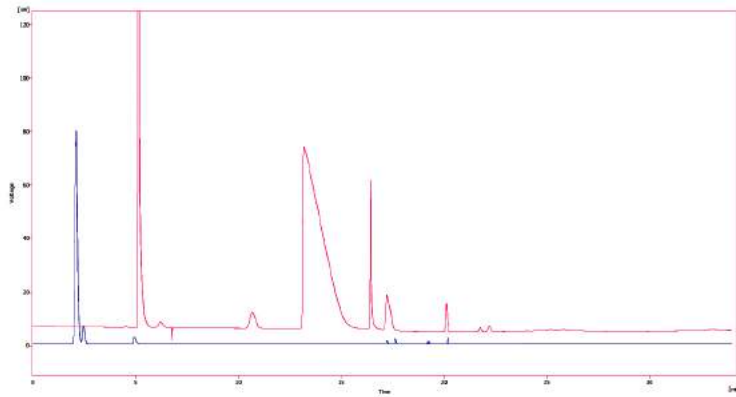
ASTM 1945, ASTM 1946, GPA 2177

#### KEY FEATURES & BENEFITS:

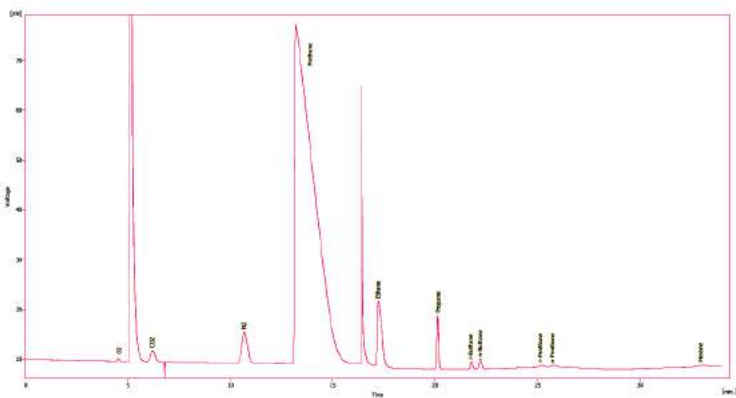
With this analyzer it is possible to separate and analyze O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, ethane, propane, *n*-butane, *n*-pentane, *i*-pentane, and hexane or part of them ;

Dual channels system with  $\mu$ TCD and FID detectors for higher sensitivity, reliability, and speed;

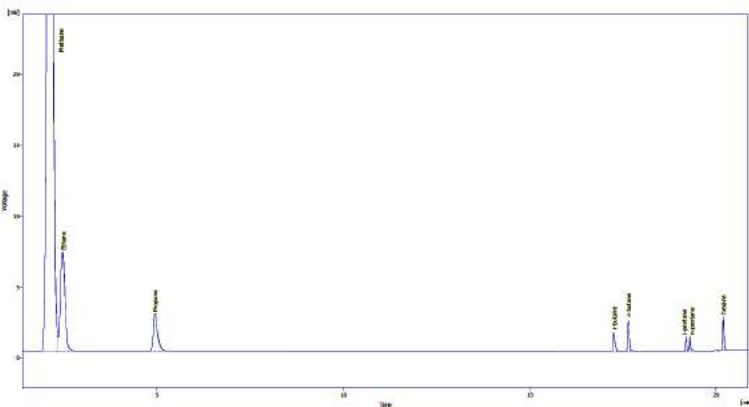
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



μTCD (purple line) and FID (blue line) overlaid chromatograms of the gas standard mixture.



μTCD analysis of C6 hydrocarbons mixture



FID analysis of C6 hydrocarbons mixture

### EXPERIMENTAL PARAMETERS

#### Master GC Analyzer

Columns	Channel A	Hayesep Q (3m, 1/16", 80/100 mesh) Molsieve 5A (3m, 0.25 mm ID, 80/100 mesh)
	Channel B	Al <sub>2</sub> O <sub>3</sub> /Na <sub>2</sub> SO <sub>4</sub> (25m, 0.25mm ID, 4 μm)

#### GC Oven

Temperature	1) T: 35°C, Time: 16 min, Rate: 50°C/min 2) T: 200°C, Time: 15 min
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#### Injector B: SL/IN

Temperature	250°C
Carrier Gas	Helium
Split Ratio	1:1
Flow	20 ml/min

#### Injector C: SL/IN

Temperature	250°C
Carrier Gas	Helium
Split Ratio	1:400
Flow	2ml/min

#### Det A: μTCD

Temperature Control	160°C
Main Filament Temperature	190°C
Main Filament Safety	Injector B
Min. Half-Peak Width	0.6 s
Digital Acquisition Rate	25 Hz
Signal Zeroing	10 mV

#### Det C: FID

Temperature	300°C
Aux Flow	25 ml/min
H <sub>2</sub> Flow	40 ml/min
Air Flow	280 ml/min

# NATURAL GAS ANALYSIS

## DGA-025

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons and Sulfur Compounds

The DGA-025 Analyzer can perform the analysis of permanent Gas, Hydrocarbons and Sulfur Compounds with two Split/Split-less Injectors (SL/IN), micro-packed and capillary columns, a Micro Thermal COnductivity Detector ( $\mu$ TCD) and a Flame Photometric Detector (FPD).

The system is equipped also with a FLame Ionization Detector that can be used for the Hydrocarbons analysis. One 10-port valve for gas samples injection and one 6-port switch valve are located in the GC auxiliary oven

DANI DGA-025 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons and Sulfur Compounds

*Master* **DGA-025**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, CO, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, ethane, propane, n-butane, isobutane, n-pentane, isopentane

#### OFFICIAL METHODS MET:

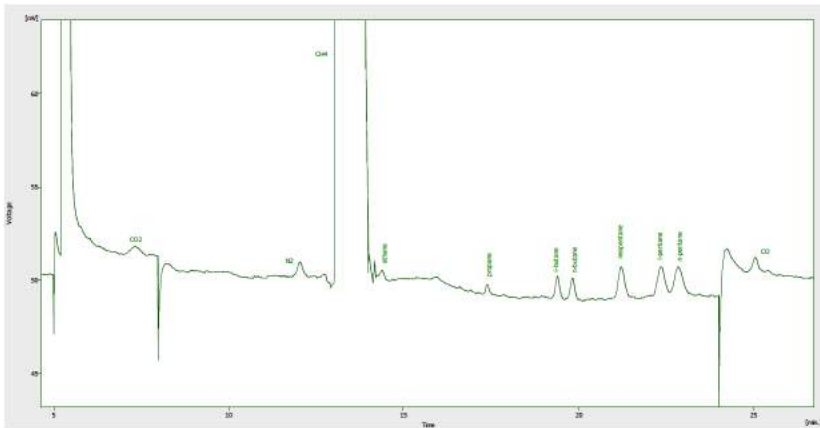
ASTM 1945, ASTM 1946, GPA 2177

#### KEY FEATURES & BENEFITS:

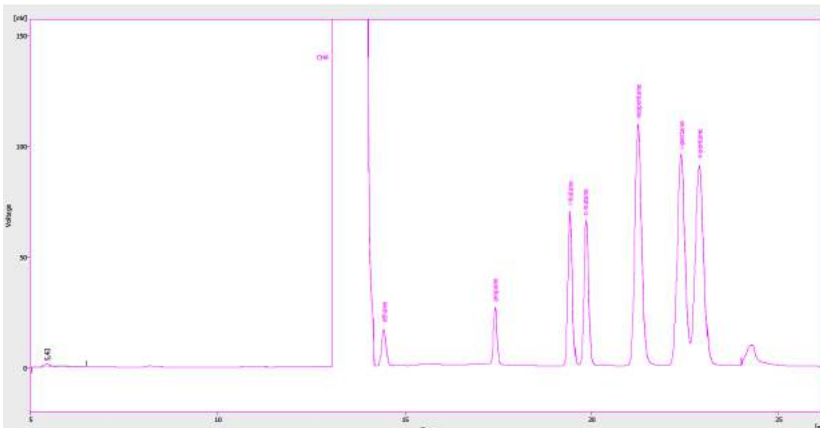
Analysis of the permanent gas and hydrocarbons is performed using the channel equipped with  $\mu$ TCD and FID detector. The hydrocarbons gas sample is introduced using the 10-port valve and carried to the Hayesep Q and Molesieve columns by carrier C. At the same time the 10-port valve, using carrier B, injects the sample to the second channel equipped with the GasPro capillary column and the FPD detector;

Furthermore it is possible to analyze sulfur compounds using the channel equipped with FPD detector;

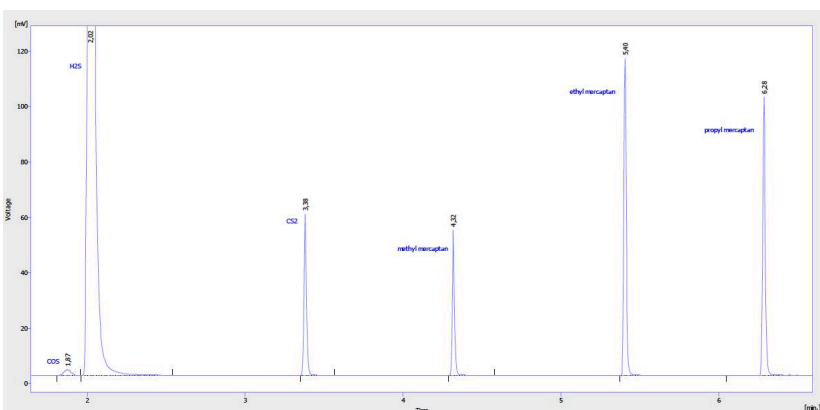
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



mTCD (channel C) chromatogram of the gas standard mixture (C5).  
Peaks correspond to: CO<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, ethane, propane, isobutane, n-butane, isopentane, n-pentane, CO.



FID (channel B) chromatogram of the gas standard mixture (C5).  
Peaks correspond to: CH<sub>4</sub>, ethane, propane, isobutane, n-butane, neopentane, isopentane, n-pentane.



FPD (channel A) chromatogram of the standard gas mixture. It is possible to identify the peaks corresponding to: COS, H<sub>2</sub>S, CS<sub>2</sub>, methyl mercaptan, ethyl mercaptan, propyl mercaptan.

### EXPERIMENTAL PARAMETERS FOR PERMANENT GAS AND HYDROCARBONS ANALYSIS

Master GC Analyzer	
Columns	<b>Hayesep Q</b> (3m, 1mm ID, 1/16" OD, 80/100 mesh) <b>Molsieve 5A</b> (3m, 1mm ID, 1/16" OD, 80/100 mesh) <b>GasPro</b> (30m, =.32 mm ID) <b>Tmax</b> : 250°C
GC Oven	
Temperature	at 10 min 34°C to 200°C at 20°C/min for 15 min
Injector B: SL/IN	
Temperature	200°C
Carrier Gas	Helium
Split Ratio	1:2
Flow	5 ml/min
Injector C: SL/IN	
Temperature	200°C
Carrier Gas	Helium
Split Ratio	1:2
Flow	15 ml/min
Det A: FPD	
Temperature	200°C
Aux Flow	15 ml/min
H <sub>2</sub> Flow	200 ml/min
Air Flow	2 ml/min
Air 2 Flow	160 ml/min
Aux Type	Nitrogen
PMP Voltage	0.650 kV
Det B: FID	
Temperature	300°C
Aux Flow	25 ml/min
H <sub>2</sub> Flow	40 ml/min
Air Flow	280 ml/min
Aux Type	Nitrogen

### EXPERIMENTAL PARAMETERS FOR SULPHUR COMPOUNDS

Master GC Analyzer	
Columns	<b>GasPro</b> (30m, =.32 mm ID) <b>Tmax</b> : 250°C
GC Oven	
Temperature	40°C to 250°C at 30°C/min for 3 min
Injector B: SL/IN	
Temperature	200°C
Carrier Gas	Helium
Split Ratio	1:2
Flow	5 ml/min
Det A: FPD	
Temperature	250°C
Aux Flow	15 ml/min
H <sub>2</sub> Flow	200 ml/min
Air Flow	2 ml/min
Air 2 Flow	160 ml/min
Aux Type	Nitrogen
PMP Voltage	0.650 kV

# NATURAL GAS ANALYSIS

## DGA-026

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons and CO<sub>2</sub>

The analysis of permanent gas and hydrocarbons up to C<sub>6</sub> is performed using two split/splitless injectors, two capillary columns, a Flame ionization Detector and a Micro Thermal Conductivity Detector.

The system is equipped with two valves: one 10-port valve located in the GC auxiliary oven and a 8-port valve located on the external side of the GC.

DANI DGA-026 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons and CO<sub>2</sub>

**Master DGA-026**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

CO<sub>2</sub>, methane, ethane, propane, *i*-butane, *n*-butane, *i*-pentane, and hexane

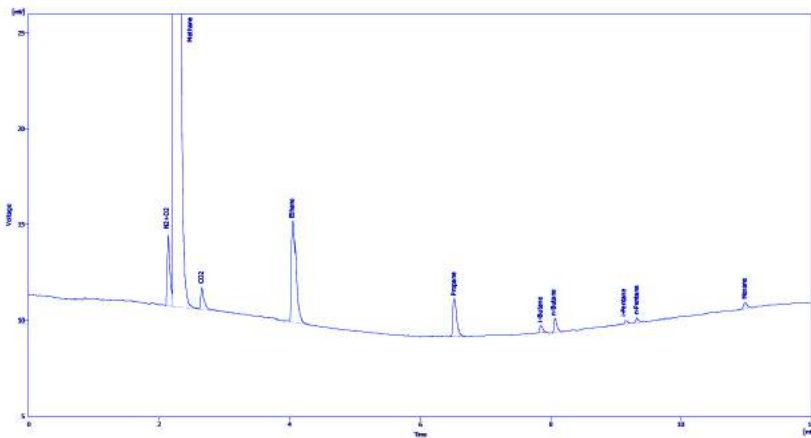
#### KEY FEATURES & BENEFITS:

Gas analysis is performed using the system that includes two SL/IN injectors, a 10-port valve for sampling, a 8-port liquid valve, two types of columns: Porabond Q and Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub> Plot, a FID detector and a μTCD detector;

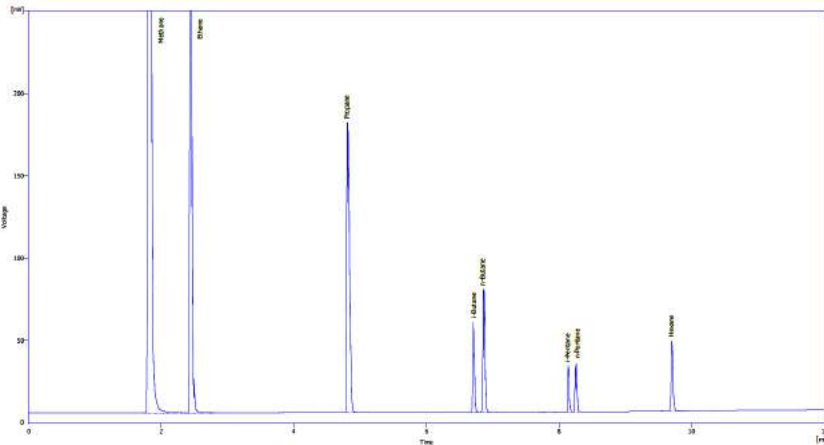
Excellent separation of all the components is guaranteed by the use of an optimized combination of columns;

The dual channels system combines the performances of the μTCD and the FID detectors for higher sensitivity and precision;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



μTCD analysis of C6 hydrocarbons mixture



FID analysis of C6 hydrocarbons mixture

EXPERIMENTAL PARAMETERS		
<b>Master GC Analyzer</b>		
Columns	Channel A	Poraplot Q (25m, 0.25 mm ID, 3 μm)
	Channel B	Al <sub>2</sub> O <sub>3</sub> /Na <sub>2</sub> SO <sub>4</sub> (25m, 0.25mm ID, 4 μm)
<b>GC Oven</b>		
Temperature	1) T: 35°C, Time: 3 min, Rate: 30°C/min 2) T: 190°C, Time: 4 min	
<b>Injector B: SL/IN</b>		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:100	
Flow	1 ml/min	
<b>Injector C: SL/IN</b>		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:150	
Flow	1ml/min	
<b>Det A: μTCD</b>		
Temperature Control	160°C	
Main Filament Temperature	190°C	
Main Filament Safety	Injector B	
Min. Half-Peak Width	0.6 s	
Digital Acquisition Rate	25 Hz	
Signal Zeroing	10 mV	
<b>Det C: FID</b>		
Temperature	300°C	
Aux Flow	25 ml/min	
H <sub>2</sub> Flow	40 ml/min	
Air Flow	280 ml/min	
<b>Aux Temp</b>		
Aux Temperature	80°C	

# NATURAL GAS ANALYSIS

## DGA-027

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons and CO<sub>2</sub>

This MASTER GC Analyzer enables the analysis of permanent gas, CO<sub>2</sub> and hydrocarbons up to C<sub>4</sub> or C<sub>6</sub> using two different pathways, channel A and channel B equipped as follows:

Channel 1 is composed by two flow control module injectors, a 10-port valve for sampling and switching, a 6- port valve for switching, three types of columns: Hayesep T, Hayesep Q, Molesieve 5A and a micro thermal conductivity detector (μTCD).

This channel fulfills the need of an accurate determination of permanent gas, CO<sub>2</sub> and hydrocarbons up to C<sub>4</sub>.

Channel 2 is composed by a split/Splitless injector, a 6-port sampling valve and a flame ionized detector (FID) for the determination of hydrocarbons up to C<sub>6</sub>.

DANI DGA-027 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons and CO<sub>2</sub>

**Master DGA-027**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

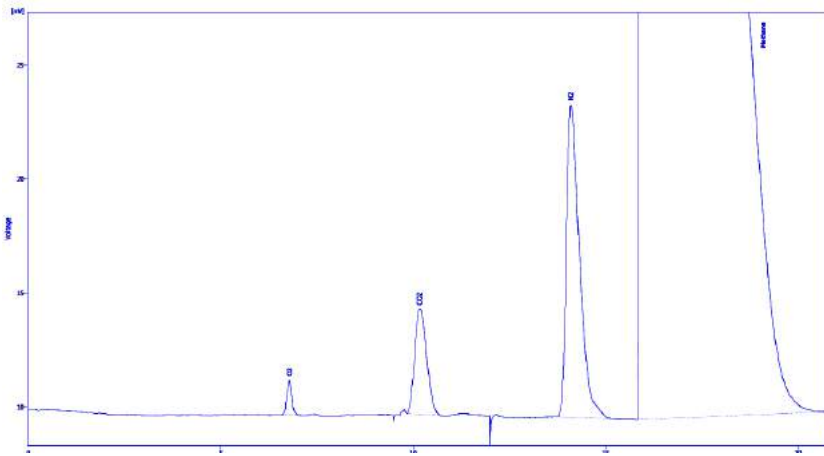
CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, methane, ethane, propane, *i*-butane, *n*-butane

#### KEY FEATURES & BENEFITS:

Excellent separation of all the compounds through the use of an optimized combination of columns;

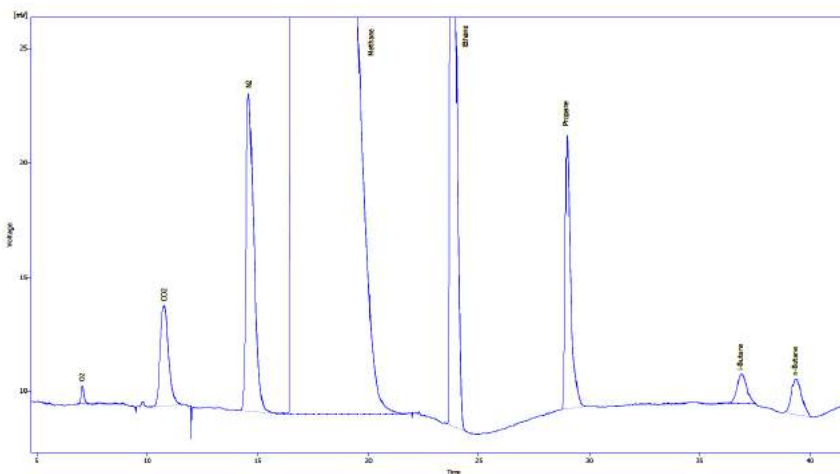
Higher sensitivity and precision are obtained through the use of the μTCD and FID detectors. The μTCD allows an excellent detection of permanent gases, hydrocarbons up to C<sub>4</sub> and CO<sub>2</sub>. The FID is the best solution for the analysis of hydrocarbons;

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



μTCD chromatogram of gas standard mixture for permanent gas and hydrocarbons up to C4.

EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO <sub>2</sub> AND HYDROCARBONS		
<b>Master GC Analyzer</b>		
Columns	Channel A	Hayesep T (1m, 80/100 mesh) Hayesep Q (3m, 1mm, 1/16", 80/100 mesh) Molsieve 5A (3m, 1mm, 1/16", 80/100 mesh)
<b>GC Oven</b>		
Temperature	1) T : 35°C, Time: 22 min, Rate: 50°C/min 2) T: 140°C, Time: 18 min	
<b>Injector A: SL/IN</b>		
Carrier Gas	Helium	
Flow	1 ml/min	
<b>Injector B: SL/IN</b>		
Carrier Gas	Helium	
Flow	18 ml/min	
<b>Det A: μTCD</b>		
Temperature Control	160°C	
Main Filament Temperature	190°C	
Main Filament Safety	Injector A	
Min. Half-Peak Width	0.6 s	
Digital Acquisition Rate	25 Hz	
Signal Zeroing	10 mV	
<b>Aux Temp</b>		
Aux Temperature	80°C	



FID analysis of C6 hydrocarbons mixture

EXPERIMENTAL PARAMETERS FOR HYDROCARBONS		
<b>Master GC Analyzer</b>		
Columns	Channel B	Poraplot Q (50m, 0.32mm, 5μm)
<b>GC Oven</b>		
Temperature	1) T : 35°C, Time: 22 min, Rate: 50°C/min 2) T: 140°C, Time: 18 min	
<b>Injector A: SL/IN</b>		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:25	
Flow	2 ml/min	
<b>Det C: FID</b>		
Temperature	250°C	
Aux Flow	25 ml/min	
H <sub>2</sub> Flow	40 ml/min	
Air Flow	280 ml/min	



# NATURAL GAS ANALYSIS

## DGA-028

### Natural Gas Analyzer for Permanent Gas, Hydrocarbons, H<sub>2</sub> and CO<sub>2</sub>

The DGS-028 Analyzer enables the analysis of permanent gas, CO<sub>2</sub> and hydrocarbons up to C<sub>6</sub> using three different pathways, channel 1, channel 2 and channel 3 equipped as follows:

Channel 1 is composed by a flow control module injector, a 10-port valve for sampling and switching, a 6-port valve for switching, two types of columns: Plot Q and Molsieve 5A and a thermal conductivity detector (TCD). This channel fullfills the need of an accurate determination of permanent gas, CO<sub>2</sub> and CH<sub>4</sub>.

Channel 2 is composed by a flow control module injector, a 10-port valve for sampling and switching, two types of columns: Plot Q and Molsieve 5A and a thermal conductivity detector (TCD). This channel fullfills the need of an accurate determination of H<sub>2</sub>.

Channel 3 is composed by a SL/IN injector, a 6-port valve for switching, an Alumina column and a flame ionized detector (FID). Sampling is made by a single "sample in" for all channels.

DANI DGA-028 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, Hydrocarbons, H<sub>2</sub> and CO<sub>2</sub>

**Master DGA-028**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>, methane, ethane, propane, *i*-butane, *n*-butane, *i*-pentane, *n*-pentane, *n*-hexane

#### OFFICIAL METHODS MET:

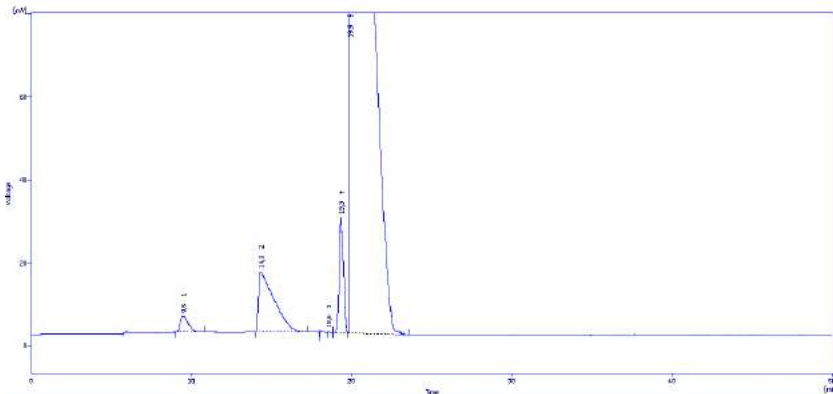
ASTM 1945, ASTM 1946, GPA 2177

#### KEY FEATURES & BENEFITS:

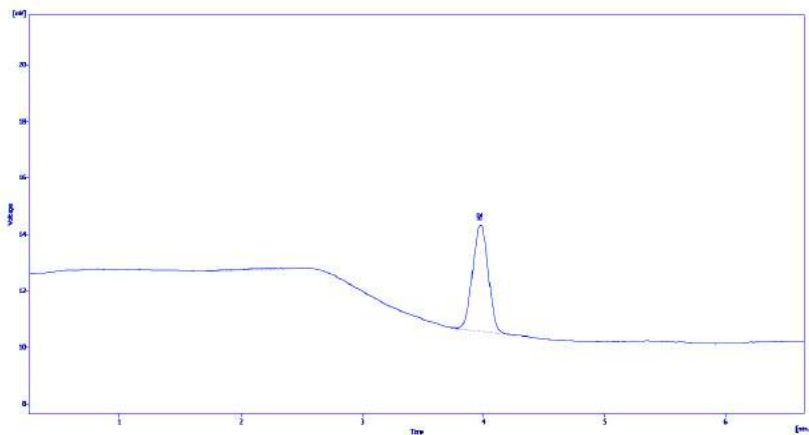
Three channel system for a comprehensive, fast, and accurate analysis of permanent gases, hydrocarbons, CO<sub>2</sub>, H<sub>2</sub>, and CH<sub>4</sub>;

Higher sensitivity and precision are obtained through the use of the  $\mu$ TCD and FID detectors;

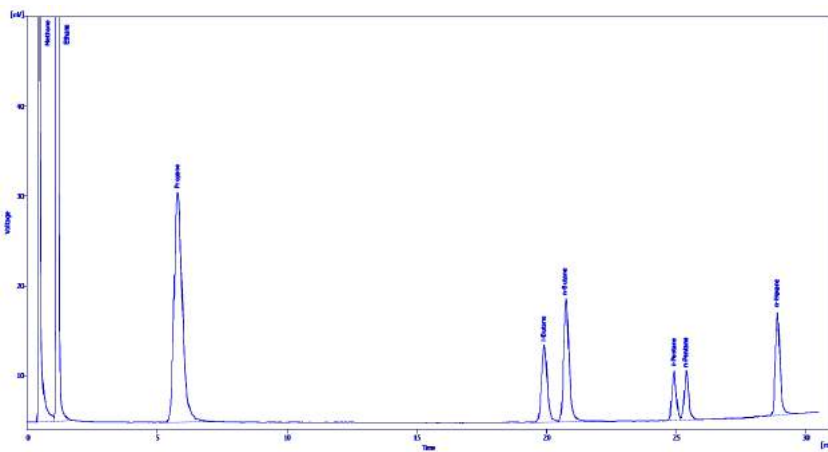
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



Chromatogram of the gas standard mixture on Channel 2.  
The peaks correspond to: CO<sub>2</sub>, C<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>



µTCD chromatogram of gas standard mixture



FID chromatogram of the gas standard mixture

EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO <sub>2</sub> , H <sub>2</sub> AND HYDROCARBONS		
<b>Master GC Analyzer</b>		
Columns	Channel 1	<b>Porapak Q</b> (3m, 80/100 mesh, 1/8") <b>Molsieve 5A</b> (3m, 80/100 mesh, 1/8")
	Channel 2	<b>Porapak Q</b> (3m, 80/100 mesh, 1/8") <b>Molsieve 5A</b> (3m, 80/100 mesh, 1/8")
	Channel 3	<b>Alumina</b> (1m, 80/100 mesh, 1/16")
<b>GC Oven</b>		
Temperature	1) T : 40°C, Time: 15 min, Rate: 10°C/min 2) T: 200°C, Time: 4 min	
<b>Injector A: SL/IN</b>		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:80	
Flow	1 ml/min	
<b>Injector B: SL/IN</b>		
Carrier Gas	Helium	
Flow	8 ml/min	
<b>Injector C: SL/IN</b>		
Carrier Gas	Helium	
Flow	20 ml/min	
<b>Det A: TCD</b>		
Temperature Control	250°C	
Filaments Control	7.40 V	
Polarity	Negative	
Max Current	180 mA	
Filament Safety	Aux Gas 3	
Filament Safety	Aux Gas 1	
Min. Half-Peak Width	0.60 s	
Digital Acquisition Rate	25 Hz	
Signal Zeroing	10 mV	
<b>Det B: TCD</b>		
Temperature Control	250°C	
Filaments Control	7.40 V	
Polarity	Positive	
Max Current	180 mA	
Filament Safety	Inj C	
Filament Safety	Aux Gas 2	
Min. Half-Peak Width	0.60 s	
Digital Acquisition Rate	25 Hz	
Signal Zeroing	10 mV	
<b>Det C: FID</b>		
Temperature	300°C	
AUX flow	25 ml/min	
H <sub>2</sub> flow	40 ml/min	
Air flow	280 ml/min	
<b>Auxiliary Pressure</b>		
AUX 1 pressure	0.70 bar	
AUX 2 pressure	1.10 bar	
AUX 3 pressure	3.00 bar	
<b>Aux Temperature</b>		
Aux Temperature	80°C	

# NATURAL GAS ANALYSIS

## DGA-033

Natural Gas Analyzer for Permanent Gas, CO<sub>2</sub>, Hydrocarbons, COS, H<sub>2</sub>S and CS<sub>2</sub>

This MASTER GC Analyzer enables the analysis of permanent gas, CO<sub>2</sub>, COS, H<sub>2</sub>S, CS<sub>2</sub> and hydrocarbons up to C<sub>6</sub>.

The analysis are performed with two different pathway equipped as follows:

Channel 1 is composed by a PK injector, two types of columns (Plot Q and Molesieve), a micro Thermal Conductivity Detector ( $\mu$ TCD), a Flame Photometric Detector (FPD);

Channel 2 is composed by a SL/IN injector, a Plot Q column and a Flame Ionized Detector (FID).

Moreover, the gas chromatograph is configured with a 10-ports valve for sampling, two 6-ports valves for switching and a 8-ports liquid valve all located in the GC auxiliary oven.

DANI DGA-033 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, CO<sub>2</sub>, Hydrocarbons, COS, H<sub>2</sub>S, and CS<sub>2</sub>

**Master DGA-033**

### SAMPLE TYPE:

Gas

### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, COS, H<sub>2</sub>S, CS<sub>2</sub>, methane, ethane, propane, *i*-butane, *n*-butane, *i*-pentane, *n*-pentane, *n*-hexane;

### OFFICIAL METHODS MET:

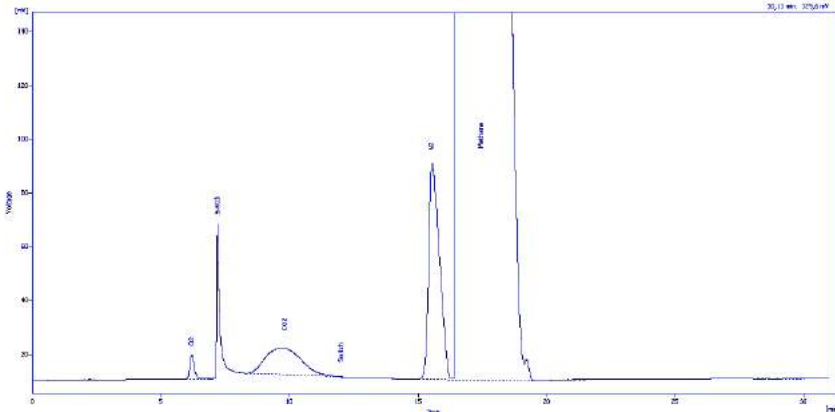
### KEY FEATURES & BENEFITS:

Typical components of interest in this type of gas analysis are: O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, CO, COS, H<sub>2</sub>S, CS<sub>2</sub>, methane, ethane, propane, *i*-butane, *n*-butane, *i*-pentane, *n*-pentane and *n*-hexane.

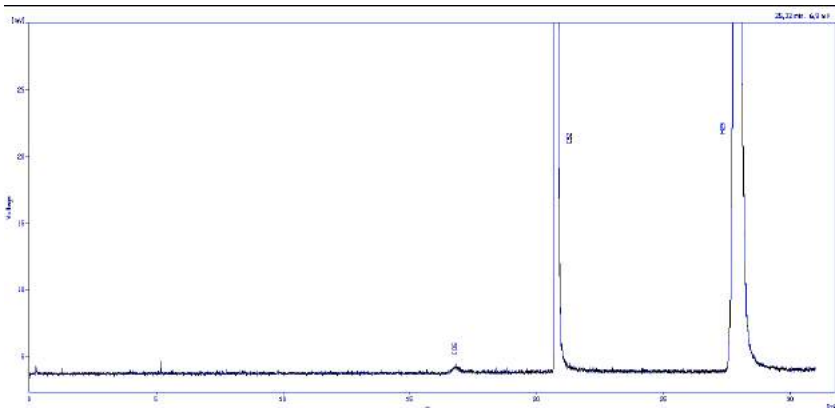
With this analyzer it is possible to separate and analyze these compounds or part of them.

Higher sensitivity and precision are obtained through the use of the  $\mu$ TCD and FID detectors;

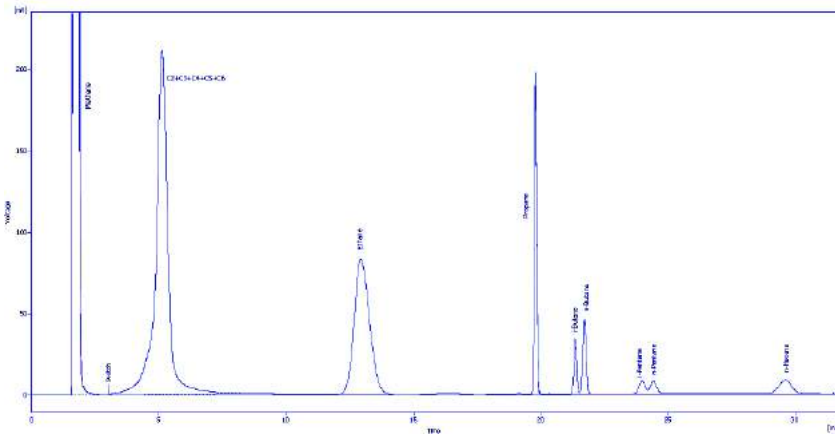
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



µTCD (Chn 1) chromatogram of the gas standard mixture



FPD (Chn 1) analysis of sulphur compounds mixture



FID (Chn 2) analysis of C6 hydrocarbons mixture

**EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO<sub>2</sub>, HYDROCARBONS AND SULPHUR COMPOUNDS**

Master GC Analyzer		
Columns	Channel 1	Plot Q (3m, 1/16 OD) Molsieve (3m, 1/16 OD)
	Channel 2	Plot Q (3m, 1/16 OD)
GC Oven		
Temperature	1) T : 35°C, Time: 15 min, Rate: 30°C/min 2) T: 200°C, Time: 11 min	
Injector A: PK		
Temperature	250°C	
Carrier Gas	Helium	
Flow	10 ml/min	
Injector B: SL/IN		
Temperature	250°C	
Carrier Gas	Helium	
Split Ratio	1:25	
Flow	8 ml/min	
Det A: FPD		
Temperature Control DBB	250°C	
Detector Head Temperature (Aux Temp 2)	130°C	
H <sub>2</sub> Flow Rate	200 ml/min	
Air 1 Flow Rate	160 ml/min	
Air 2 Flow Rate	160 ml/min	
Aux Flow Rate (N <sub>2</sub> )	15 ml/min	
Photomultiplier voltage	0.72 kV	
Range	1	
Min. Half-Peak Width	0.60 s	
Digital Acquisition Rate	25 Hz	
Det B: FID		
Temperature	300°C	
Aux Flow Rate (N <sub>2</sub> )	25 ml/min	
H <sub>2</sub> Flow Rate	40 ml/min	
Air Flow Rate	280 ml/min	
Range	10	
Min. Half Peak Width	0.60 s	
Digital Acq. Rate	25 Hz	
Det C: µTCD		
Temperature Control	160°C	
Main Filament Temperature	190°C	
Main Filament Safety	Injector A	
Min. Half-Peak Width	0.60 s	
Digital Acquisition Rate	25 Hz	
Signal Zeroing	10 mV	
Auxiliaries		
Aux Temp 1- for Aux Oven	80°C	
Aux Temp 2 - For Detector Head temp FPD	130°C	
Aux Gas (N <sub>2</sub> ) - for Backflush	1.7 bar	

# NATURAL GAS ANALYSIS

## DGA-034

### Natural Gas Analyzer for Permanent Gas and Hydrocarbons

The analysis with the DGA-034 Analyzer is performed using two Packed Column Injectors (PK), three micropacked columns and two Thermal Conductivity Detectors (TCD).

Moreover, the Gas Chromatograph is configured with two valves located in the auxiliary oven: a 10-port valve for injection in the analytical channels and a 6-port valve on Channel 1.

DANI DGA-034 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and Hydrocarbons

*Master* **DGA-034**

#### SAMPLE TYPE:

Gas

#### TYPICAL DETECTED COMPOUNDS:

O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, ethane, propane, butane, pentane, and hesane;

#### OFFICIAL METHODS MET:

ASTM 1945, ASTM 1946, GPA 2177;

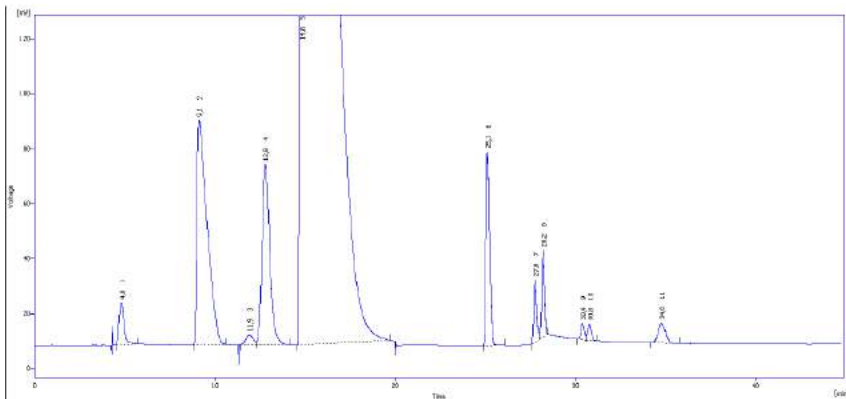
#### KEY FEATURES & BENEFITS:

Gas analysis is performed using this complete system that allows to determinate permanent gas and hydrocarbons using the channel (channel 1) equipped with TCD, a packed Plot Q column and a packed Molsieve column, a 10-port valve and a 6-port valve;

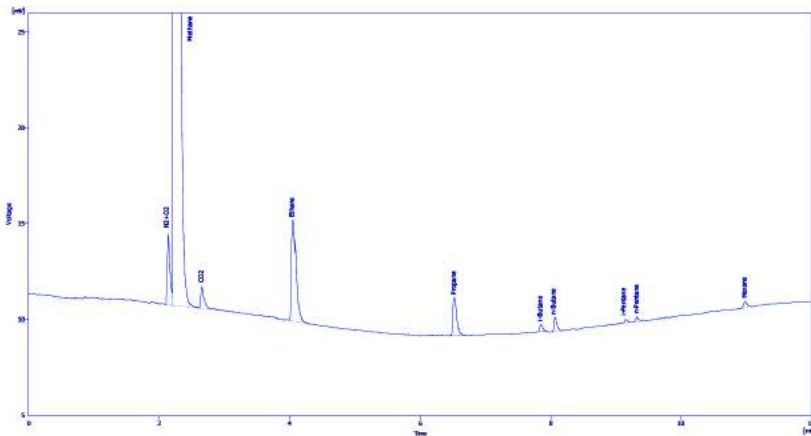
For the determination of hydrocarbons, Channel 2 is equipped with the TCD, the same 10-port valve for injection and a packed Plot Q column;

The gas sample is introduced simultaneously to each analytical channel through the 10-port valve equipped with sampling loops:

All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



Chromatogram of the gas standard mixture on Channel 1.  
The peaks correspond to: CO<sub>2</sub>, C<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, C<sub>3</sub>, iso-C<sub>4</sub>, n-C<sub>4</sub>, iso-C<sub>5</sub>, n-C<sub>5</sub>, C<sub>6</sub>



µTCD analysis of C<sub>6</sub> hydrocarbons mixture

EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO <sub>2</sub> , HYDROCARBONS AND SULPHUR COMPOUNDS		
<b>Master GC Analyzer</b>		
Columns	Channel 1	<b>Hayesep Q</b> (2,5m, 1/8", 80/100 mesh) <b>Molsieve 5A</b> (2.5m, 1/8", 80/100mesh)
	Channel 2	<b>Hayesep Q</b> (2m, 1/16", 80/100mesh)
<b>GC Oven</b>		
Temperature	1) T: 40°C, Time: 20 min, Rate: 20°C/min 2) T: 200°C, Time: 8 min	
<b>Injector A: PK</b>		
Temperature	250°C	
Carrier Gas	Helium	
Column Type	Packed - Max Pressure: 3 bar	
Flow	10 ml/min	
<b>Injector B: PK</b>		
Temperature	250°C	
Carrier Gas	Helium	
Column Type	Packed - Max pressure: 2 bar	
Flow	12 ml/min	
<b>Channel 1 - Det A: TCD</b>		
Temperature	250°C	
Voltage	7.20 V	
Polarity	Negative	
Max Current	180 mA	
Filament Safety	Inj A	
Filament Safety	Aux Gas 1	
Range	1	
Min. Half-Peak Width	0.60 s	
Digital Acq. Rate	25 Hz	
Signal Target	10 mV	
<b>Channel 1 - Det B: TCD</b>		
Temperature	250°C	
Voltage	7.30 V	
Polarity	Negative	
Max Current	180 mA	
Filament Safety	Inj B	
Filament Safety	Aux Gas 2	
Range	1	
Min. Half-Peak Width	0.60 s	
Digital Acq. Rate	25 Hz	
Signal Target	10 mV	
<b>Auxiliary Temperature</b>		
Aux Temp (°C) - Aux Oven Temp	120°C	
<b>Auxiliary Pressure</b>		
Aux Press 1	0.65 bar	
Aux Press 2	0.50 bar	

# NATURAL GAS ANALYSIS

## DGA-035

### Natural Gas Analyzer for Permanent Gas, H<sub>2</sub> and Hydrocarbons

The analysis with the DGA-035 Analyzer is performed using two injector flow controls, a split/splitless injector, micro-packed columns, a micro Thermal Conductivity Detector ( $\mu$ TCD) and a Flame Ionization Detector (FID). Moreover, the gas chromatograph is configured with three valves: an external 4-ports valve (for introduce liquid samples in the system) plus a 10-ports valve and a 6-ports valve located in the auxiliary oven.

DANI DGA-035 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and Hydrocarbons

*Master* **DGA-035**

#### **SAMPLE TYPE:**

Gas , Liquid

#### **TYPICAL DETECTED COMPOUNDS:**

H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, CO, ethane, propane, butane, pentane and C<sub>6</sub>+ (hexane and higher hydrocarbons)

#### **OFFICIAL METHODS MET:**

ASTM 1945, ASTM 1946, GPA 2177;

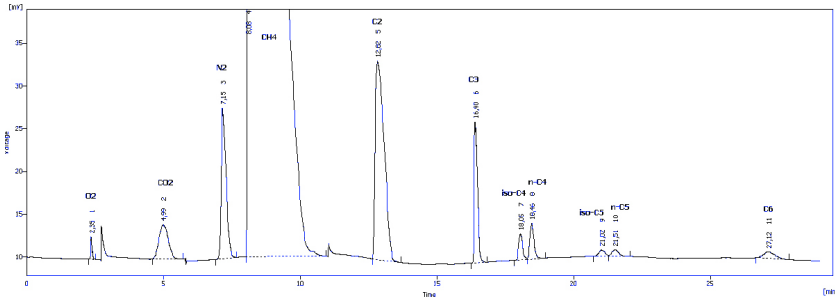
#### **KEY FEATURES & BENEFITS:**

Gas analysis is performed using this complete system that allows to determinate permanent gases, H<sub>2</sub> and hydrocarbons using the channel equipped with  $\mu$ TCD detector and the channel equipped with FID detector.

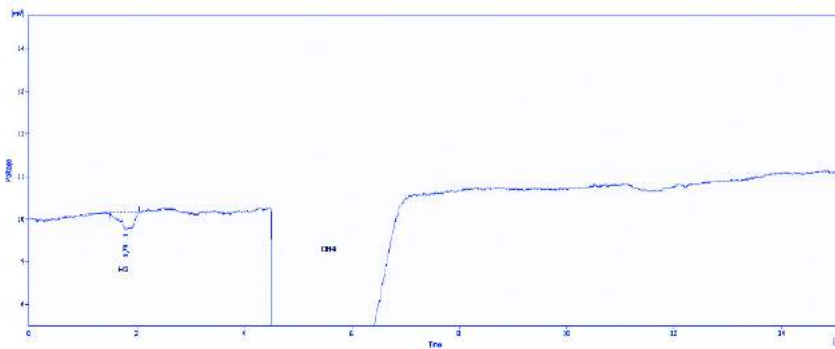
The separation of permanent gases and hydrocarbons is made possible by the presence of a micro-packed Hayesep Q column and a micro-packed Molsieve column for each channel with  $\mu$ TCD.

The gas sample is introduced simultaneously to each analytical channel (Chn 1 and 2) by the 10-ports valve equipped with two sample loops. Moreover the external valve gives the possibility to introduce liquid samples in Channel 3.

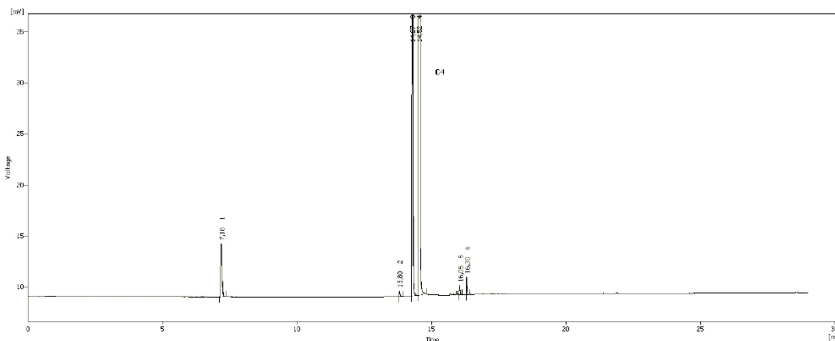
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



mTCD (Channel 1) chromatogram of the gas standard mixture.  
Labelled peaks correspond to: O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, C<sub>2</sub>, C<sub>3</sub>, iso-C<sub>4</sub>, n-C<sub>4</sub>, iso-C<sub>5</sub>, n-C<sub>5</sub>, C<sub>6</sub>



mTCD (Channel 2) chromatogram of the gas standard mixture.  
Labelled peaks correspond to: H<sub>2</sub> and CH<sub>4</sub>



FID chromatogram of the real sample of LPG

### EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO<sub>2</sub>, HYDROCARBONS AND SULPHUR COMPOUNDS

Master GC Analyzer		
Columns	Channel 1	Hayesep Q (3m, 1/16", 80/100 mesh) Molsieve 5A (3m, 1/16", 80/100mesh)
	Channel 2	Hayesep Q (3m, 1/16", 80/100mesh) Molsieve 5A (3m, 1/16", 80/100mesh)
	Channel 2	Alumina (50m, 0.32mm)
GC Oven		
Temperature	35°C (for 11 min) at 30°C/min to 200°C (for 13 min)	
Injector A: PK		
Temperature	OFF	
Carrier Gas	Helium	
Column Type	Capillary - 200m, 0.53mm	
Flow	20 ml/min	
Injector B: PK		
Temperature	OFF	
Carrier Gas	Nitrogen	
Column Type	Capillary . 200m, 0.53mm	
Flow	10 ml/min	
Inj C : SL/IN		
Temperature	200°C	
Carrier Gas	Helium	
Split Ratio	1:50	
Flow	4ml/min	
Det A : μTCD Channel 1		
Temperature	200°C	
Main Filament Temperature	190°C	
Filament Safety	Injector A	
Min. Half-Peak Width	1s	
Digital Acquisition Rate	10 Hz	
Signal Zeroing	10 mV	
Det B : μTCD Channel 2		
Temperature	160°C	
Main Filament Temperature	190°C	
Filament Safety	Injector B	
Min Half-Peak Width	1 s	
Digital Acquisition Rate	10 Hz	
Signal Zeroing	10 mV	
Det C : FID		
Temperature	300°C	
AUX Flow	25ml/min	
H2 Flow	40ml/min	
Air Flow	280ml/min	
Auxiliary Pressure		
Aux Press 1	2.6 bar	
Aux Press 2	1.45 bar	
Auxiliary Temperature		
Aux Temp (°C) - AUx Oven Temp	120°C	



# NATURAL GAS ANALYSIS

## DGA-036

### Natural Gas Analyzer for Permanent Gas, H<sub>2</sub> and Hydrocarbons

The analysis with MASTER GC Analyzer is performed using three injector flow controls, micro-packed columns and two micro Thermal Conductivity Detectors (mTCD).

Moreover, the gas chromatograph is configured with a solenoid valve and three valves located in the auxiliary oven: a 8-ports valve for Channel 1, plus a 10-ports valve and a 6-ports valve for Channel 2.

DANI DGA-036 is the ready-to-go solution to attain the maximum performance in the shortest time for your analysis of Permanent Gas, H<sub>2</sub> and Hydrocarbons

*Master* **DGA-036**

#### **SAMPLE TYPE:**

Gas

#### **TYPICAL DETECTED COMPOUNDS:**

H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, CO, ethane, propane, butane, pentane and C<sub>6</sub>+ (hexane and higher hydrocarbons)

#### **OFFICIAL METHODS MET:**

ASTM 1945, ASTM 1946, GPA 2177;

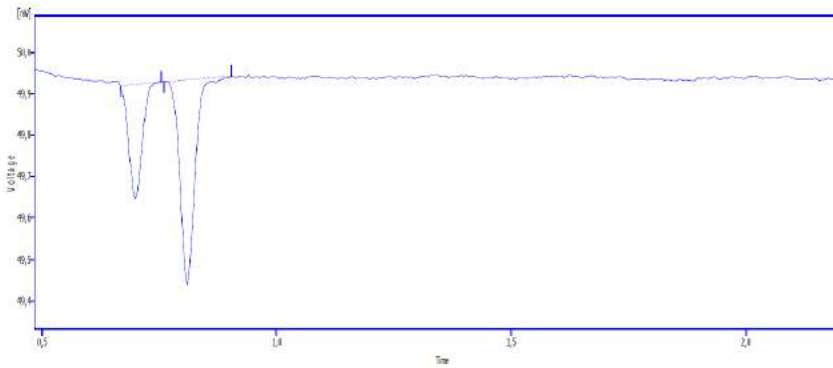
#### **KEY FEATURES & BENEFITS:**

Gas analysis is performed using this complete system that allows to determinate H<sub>2</sub> using the channel equipped with a  $\mu$ TCD, a micro-packed column and a micro-packed column, an 8-ports valve and a solenoid valve for cleaning the system by other compounds;

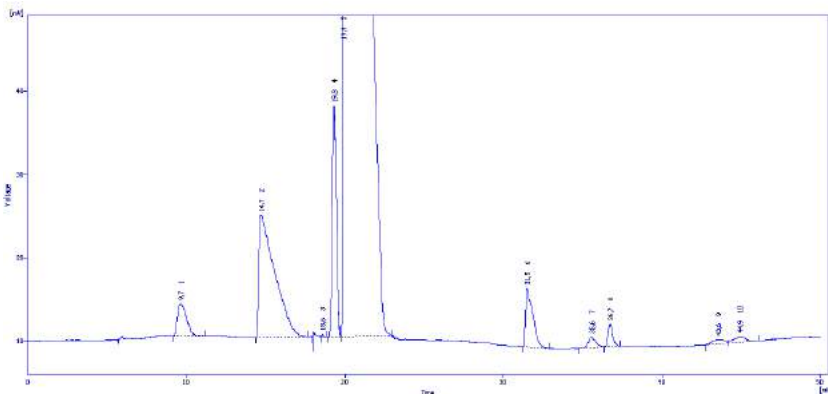
Permanent gases and hydrocarbons analysis is performed using the channel equipped with the  $\mu$ TCD, micropacked columns, a 10-ports valve and a 6-ports valve to bypass the Molsieve column.

The gas sample is introduced separately in the single analytical channels by the 8-ports and 10-ports valves equipped with sampling loops to 1 ml.

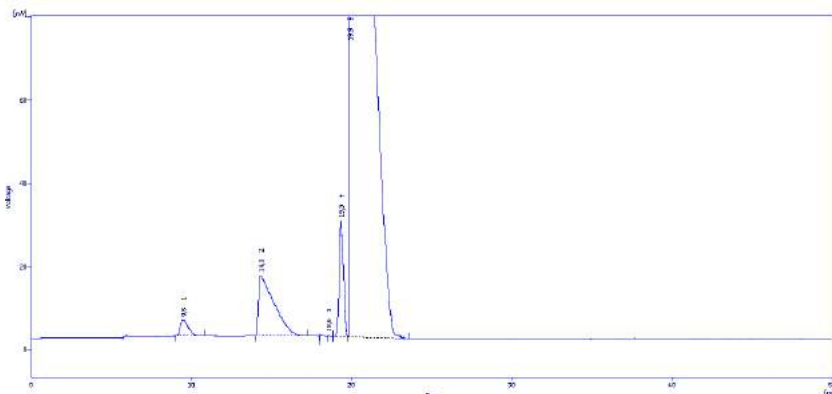
All the analytical parameters can be controlled by the DDS Clarity™ Chromatography Station Software;



Chromatogram of the gas standard mixture on Channel 1  
The peak corresponds to He+H<sub>2</sub>



Chromatogram of the gas standard mixture on Channel 2.  
The peaks correspond to: CO<sub>2</sub>, C<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>, C<sub>3</sub>, iso-C<sub>4</sub>, n-C<sub>4</sub>, iso-C<sub>5</sub>, n-C<sub>5</sub>



Chromatogram of the gas standard mixture on Channel 2.  
The peaks correspond to: CO<sub>2</sub>, C<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CH<sub>4</sub>

## EXPERIMENTAL PARAMETERS FOR PERMANENT GAS, CO<sub>2</sub>, HYDROCARBONS AND SULPHUR COMPOUNDS

### Master GC Analyzer

Columns	Channel 1	Hayesep Q (1m, 1/16", 80/100 mesh) Molsieve 5A (2m, 1/16", 80/100mesh)
	Channel 2	Hayesep T (1m, 1/16", 80/100mesh) Hayesep Q (2m, 1/16", 80/100mesh) Molsieve 13X (2m, 1/16", 80/100mesh)

### GC Oven

Temperature	Temp: 32°C, Time: 23 min, Rate: 10°C/min Temp: 32°C, Time: 13 min
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### Injector A: PK

Temperature	OFF
Carrier Gas	Nitrogen
Column Type	Capillary - 200m, 0.53mm
Flow	Set: 14 ml/min - Measured at Det C: 5.2 ml/min

### Injector B: PK

Temperature	OFF
Carrier Gas	Helium
Column Type	Capillary - 200m, 0.53mm
Flow	Set: 15 ml/min - Measured at Det C: 2.8 ml/min

### Inj C: PK

Temperature	OFF
Carrier Gas	Helium
Column Type	Capillary - 200m, 0.53
Flow	Set: 13 ml/min - Measured at Det C: 2.7 ml/min

### Det A : μTCD Channel 1

Temperature	160°C
Main Filament Temperature	190°C
Filament Safety	Injector A
Min. Half-Peak Width	0.6 s
Digital Acquisition Rate	25 Hz
Signal Zeroing	10 mV

### Det A : μTCD Channel 1

Temperature	160°C
Main Filament Temperature	190°C
Filament Safety	Injector A
Min Half-Peak Width	0.6 s
Digital Acquisition Rate	25 Hz
Signal Zeroing	10 mV

### Det C : μTCD Channel 1

Temperature	160°C
Main Filament Temperature	190°C
Filament Safety	Injector C
Min. Half-Peak Width	0.6 s
Digital Acquisition Rate	25 Hz
Signal Zeroing	10 mV

### Auxiliary Pressure

Aux Press	2.2 bar
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### Auxiliary Temperature

Aux Temp (°C) - AUX Oven Temp	100°C
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# NATURAL GAS ANALYSIS

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