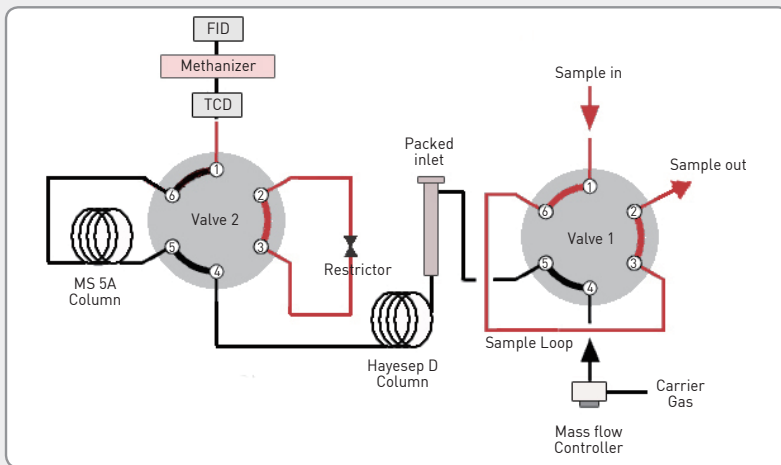


Gases Analyzer

Gases Analyzer efficiently detects and quantifies various gaseous products in a sample. The system uses either a packed or a porous layer open tubular (PLOT) column, which is a different setup from columns used to separate constituents of liquid samples. The system components include an injector, a detector and a column.

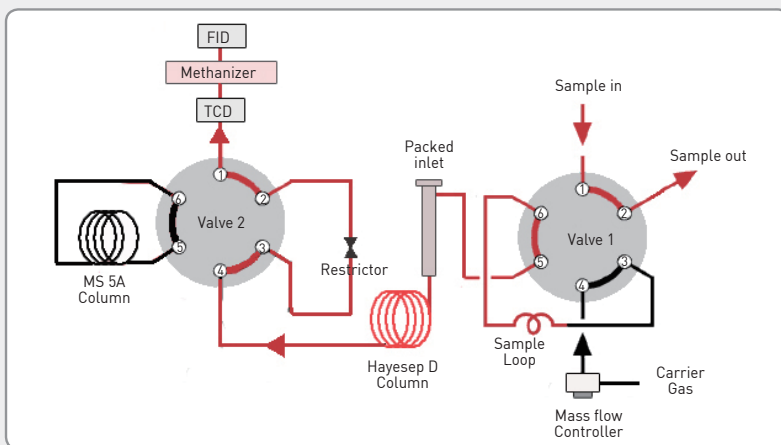
Useful Information

(1) Sampling & Switching Valves



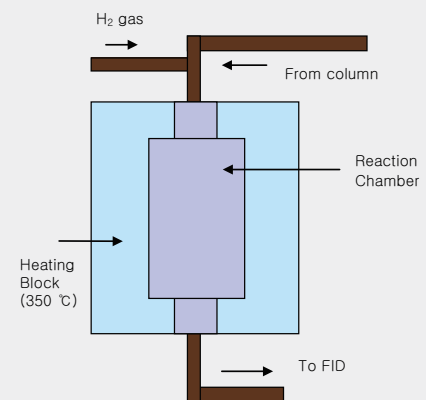
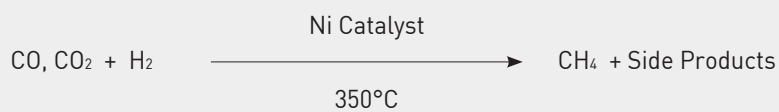
- Valve 1 is used for injection of a sample. The sample loads with the valve in the OFF position, while the sample is injected into a column with the valve in the ON position.

- Valve 2 is used for switching a fluidic way. The sample passes through both columns when the valve is in the OFF position, while the sample passes through only one column, but not the Molecular Sieve 5A column, when the valve is in the ON position.



(2) Methanizer

The Methanizer uses Nickel (Ni) as a catalyst for methanizing certain gases, such as CO and CO₂, which are not ionized by the flame. Once methanized, the FID is then capable of detecting these gases even at low concentration levels which TCD cannot detect.



(3) Recommended Columns*** MOLECULAR SIEVE 5A Column**

The Molecular sieve 5A Column uses zeolite (calcium), which has a pore size of 5 Å. This column absorbs molecules that are greater than 5 Å in size.

→ Methanol, Ethane, Propane.

*** MOLECULAR SIEVE 13X Column**

The Molecular Sieve 13X Column contains a modified sodium zeolite that has a constant pore size of 10 Å. This column effectively absorbs molecules that are greater than 10 Å in size.

→ Chloroform, Carbon Tetrachloride, Benzene.

→ Molecular Sieve column can be reused after regenerating it at 600°F (315.5 °C).

*** HAYESEP POLYMER Column**

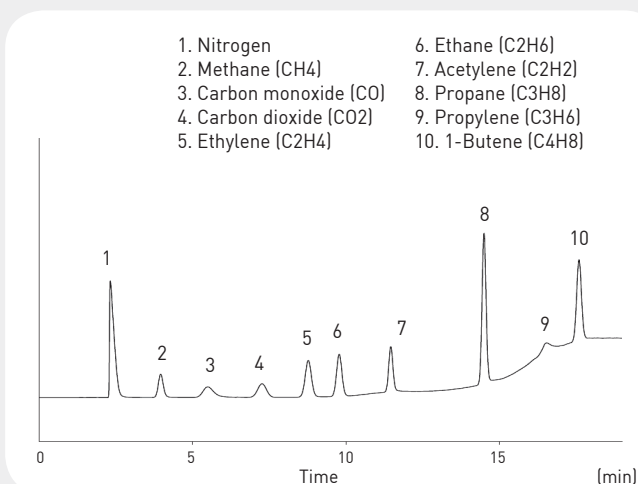
The Hayesep Polymer Column gives consistent performance with no shrinkage and minimum bleed. All Hayesep Polymer Columns are thoroughly cleaned and preconditioned using N₂ gas at 200 °C (160 °C- for N,T). Light gases such as CO, CO₂ or Acetylene is extracted first.

*** Porapak POLYMER (Durapak) Column**

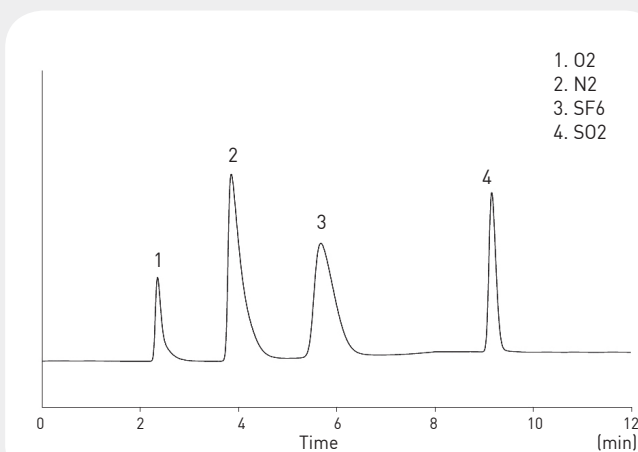
The Porapak Polymer Column is composed of organic functional groups attached to Porasil as a liquid phase. This arrangement minimizes bleed and provides better separation of the targeted gases than other liquid phase columns. This column is porous packed, with the following polarity: P < PS < Q < QS < R < S < N < T.

■ Standards Gas Samples

- Oven : 35 °C (7 min) → 15 °C/min (Heating) → 170 °C (5 min)
→ 100 °C/min → 35 °C (2 min)
- Column : Molecular sieve 13X, 1/8", 3 ft, 45/60 mesh (No.13047-U)
Porapak N, 1/8", 10ft, 80/100 mesh (No.13052-U)
- Carrier gas : He, 15 ml/min
- Injector : 120 °C
- Detector : TCD (120 °C, Sen=6, Ref 30), FID (230 °C)
(Series Connection), Methanizer : 350 °C
- Injection volume : 250 µl
- Valve program : GSV 1 Off, GSV 2 Off → 0.1 min GSV 1 On
→ 6.4 min GSV 2 On
- Signal change : 3.5 min (TCD → FID)

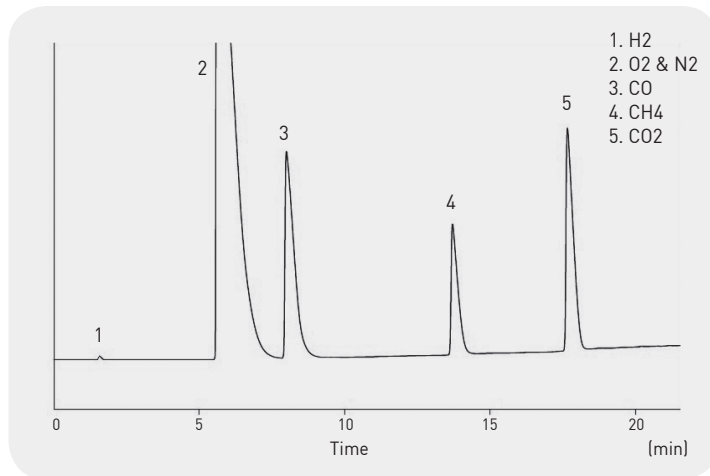
**■ Gas Samples (4)-Valve Switching**

- Oven : 35 °C (4 min) → 20 °C/min → 150 °C (5 min)
- Column : Molecular sieve 5A, 1/8", 8 ft, 60/80 mesh
Porapak Q, 1/8", 6 ft, 60/80 mesh
- Carrier gas : He, 20 ml/min
- Injector : 120 °C
- Detector : TCD (120 °C)
- Injection volume : 0.5 ml
- Valve program : GSV 1 Off, GSV 2 Off → 0.1 min GSV 1 On
→ 8.3 min GSV 2 On
- Signal change : 8.0 min-8.7 min (TCD → none → TCD)



■ Gas Samples (3)

- Oven : 35 °C (5min) → 10 °C/min → 225 °C (5min)
- Column : Carboxen 1000, 1/8", 15 ft, 60/80 mesh
- Carrier gas : He, 25 ml/min
- Injector : 120 °C
- Detector : TCD (120 °C), Sens 6
- Injection Volume : 1 ml



■ Gas Sample Analysis with the Valve System (H2, CH4, CO, CO2, MeOH)

- Oven : 40 °C (6 min) → 30 °C/min → 150 °C (0.1 min)
- Column : Capillary 1 - DB-624 (30 m, 0.53 mm, 3.0 μm)
Capillary 2 - CarbonPLOT (30 m, 0.53 mm, 3.0 μm)
- Injector : Capillary1 (120 °C) Ar 30 ml/min (Split ratio 5:1)
Capillary2 (120 °C) Ar 4 ml/min (Split ratio 5:1)
Valve 1 (10port, 120 °C, 250 μl loop x2), V2 (6port, 120 °C)
- Detector : MET 350 °C -FID 230 °C, TCD 120 °C (Ref21/Mkup17 ml/min)
- Valve program :

| Time (min) | Valve1 | Valve2 |
|------------|--------|--------|
| 0.1 | on | off |
| 6.5 | - | on |

