

Transformer Oil Gas Analysis - TOGA

The DPS Micro-TCD TOGA GC System is designed to analyze oil from electrical insulation materials that may have decomposed under thermal, or electrical stresses following ASTM 3612C for gas analysis using headspace injection. The gaseous decomposition products indicate the type of fault inside the transformer.

The DPS Micro-TCD TOGA GC System separates all 11 components in one injection; Hydrogen, Oxygen, Nitrogen, Methane, Carbon Monoxide, Ethane, Carbon Dioxide, Ethylene, Propane, Acetylene, and Propylene. All compounds are detected to 1ppm with the ultra-sensitive Micro-TCD Detector (Micro-machined Thermal Conductivity Detector) in less than 2 minutes.

The headspace sample is heated and stirred by the 42 vial Autosampler prior to injection into the 2 channel TOGA GC System. The 1st Channel separates the permanent gases and the 2nd Channel separates the C2-C3 hydrocarbons and CO₂. With the 6 heating chamber oven, the Autosampler can inject a sample every 5 min, making this the fastest TOGA analyzer ever.

The combined power of a 42 vial Dynamic Headspace Autosampler and the rugged and versatile DPS Micro-TCD GC make this routine analysis quick and easy.

Micro-TCD GC Applications

Micro-TCD TOGA GC System
Permanent Gases &
Light Hydrocarbons
Dissolved in oil!

Powerful Combination

Headspace Autosampler

Micro-TCD GC System

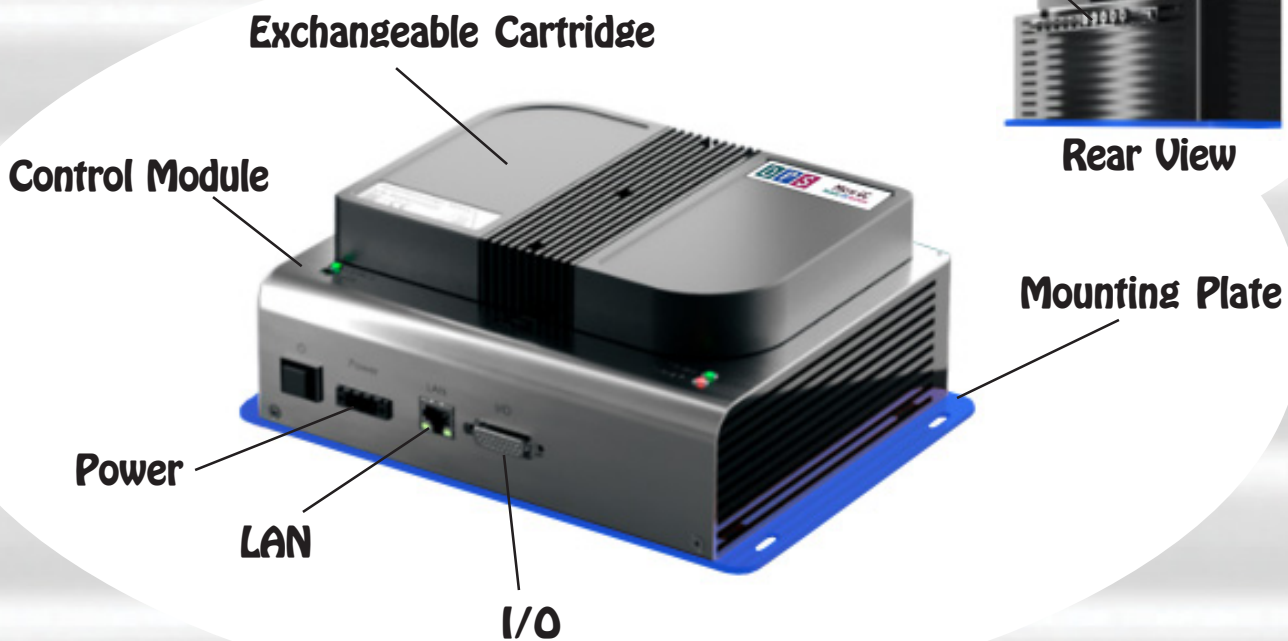


General Specifications:

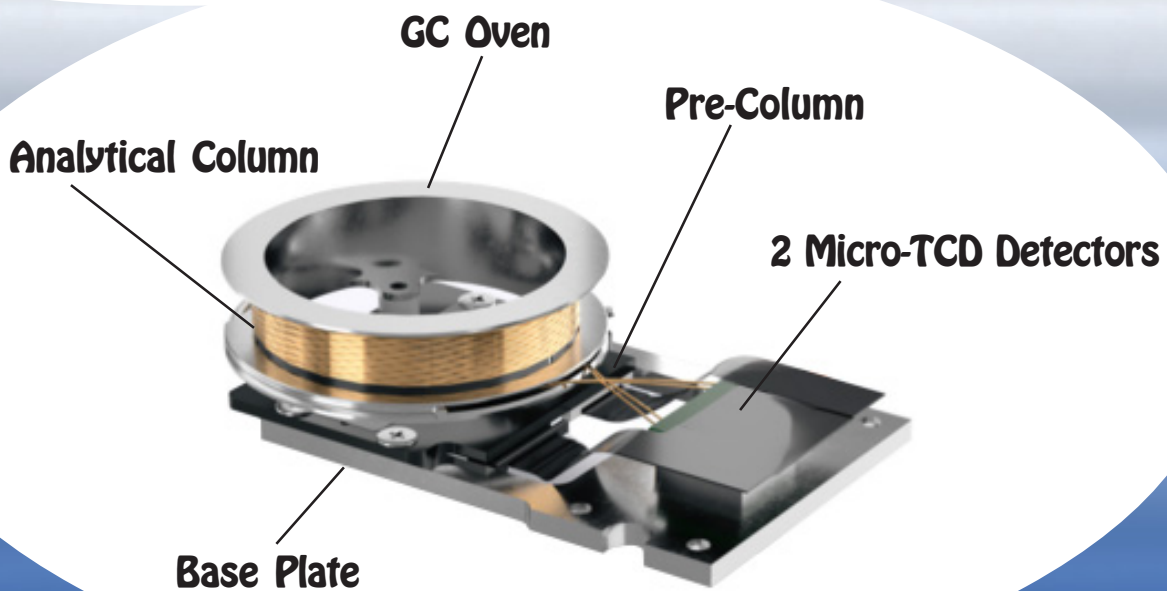
- Micro-TCD Gas Chromatograph
- 42 Vial Headspace Autosampler
- TOGA analysis in less than 2 min
- 2 Channels - GC Column Oven/Micro-TCD's
- Fast & Accurate with Low Maintenance
- Easy Chromatography Data System
- Ultra Compact and Lightweight,
GC (20 x 15 x 10 cm), approximately 8 kg
AS (33 x 64 x 32 cm), approximately 10 kg

DPS
Instruments, Inc.

DPS Micro-TCD GC Layout



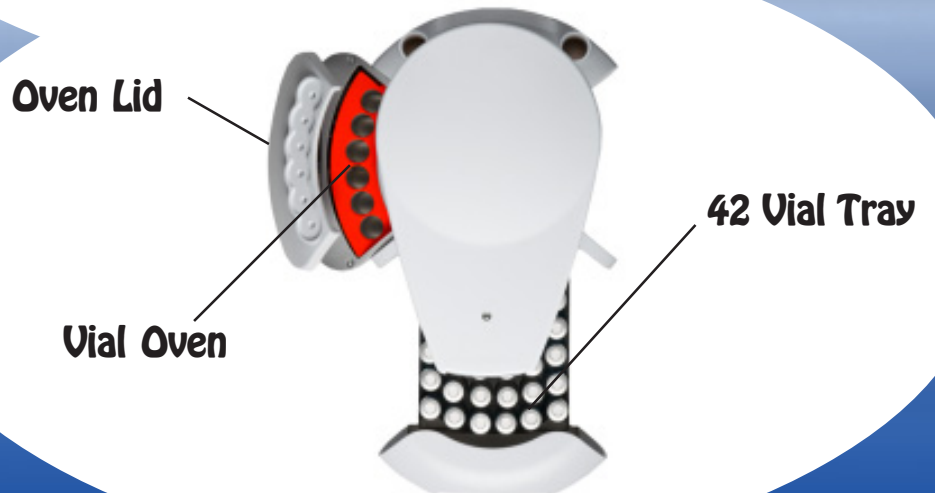
DPS Micro GC Channel



Dynamic Headspace Autosampler



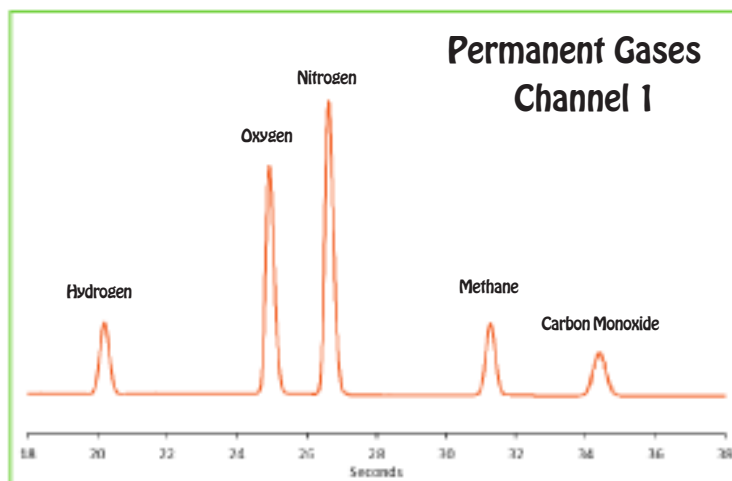
Top View



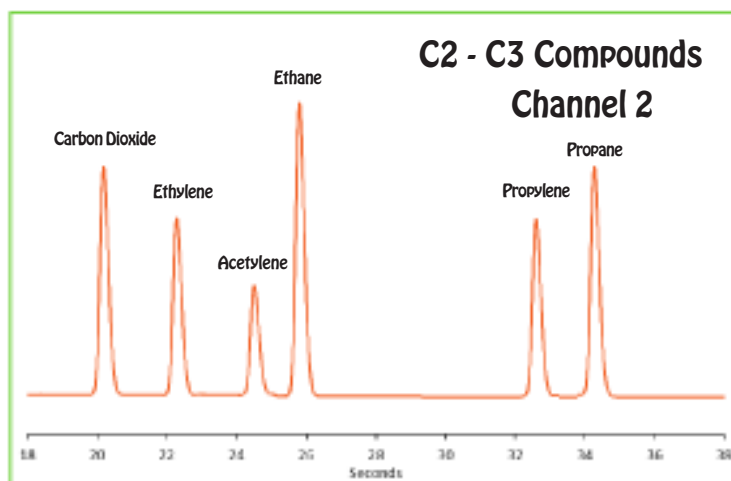
DPS Micro-TCD TOGA GC System

Channel 1 - A Molecular Sieve column is used to separate the Permanent Gas components: Hydrogen, Oxygen, Nitrogen, Methane & Carbon Monoxide using helium as a carrier gas.

After the compounds elute we back-flush the pre-column to keep the Molecular Sieve free of heavier compounds.



Channel 2 - A BOND column is used to separate the C2 - C3 Gas components: Ethane, Carbon Dioxide, Ethylene, Propane, Acetylene & Propylene using helium as a carrier gas.



DPS Micro-TCD TOGA GC Features

System Configuration - A Simple and efficient configuration combining the power of the rugged Micro-TCD GC with 2 Channels and versatile 42 vial Dynamic Headspace Autosampler. Each Channel contains a GC Oven, Analytical Column, Pre-Column, 2 Micro-TCD Detectors, Injection Valve, Back-Flush valve and Electronic & Gas Connections.

Sample Information - The eleven most common compounds are included in this analysis scheme which meets ASTM-D3612C methodology. The compounds included in this method are H₂, O₂, N₂, CH₄, CO, C₂H₆, CO₂, C₂H₄, C₂H₂, C₃H₆, and C₃H₄. The results from the analysis of these compounds helps target the underlying fault condition of the transformer. The action levels indicate the concentration levels where the fault is severe and action should be taken to mitigate any possible dangerous situation.

Micro-TCD - Parts per Million (ppm)

No.	Compound	DL	Action Level
1	Hydrogen	1-5**	100-500
2	Oxygen	1	NA
3	Nitrogen	1	NA
4	Methane	1	100-400
5	Carbon Monoxide	1	100-1000
6	Ethane	1	100-400
7	Carbon Dioxide	1	150-3000
8	Ethylene	1	500-2000
9	Propane	1	100-500
10	Acetylene	1	100-400
11	Propylene	1	100-500

**** Hydrogen** - For the lowest possible Hydrogen Detection Limit a 3rd Channel can be added to the system specifically for Hydrogen and Nitrogen would be used as the carrier gas, instead of Helium.

DPS Micro-TCD TOGA GC System Specifications:

Micro-TCD GC:

Micro GC Channels:

- 2 Micro GC Channels in an Exchangeable Cartridge
- Each GC Channel contains GC Oven, Analytical Column, Pre-Column, 2X Micro-TCD Detectors, Injection and Back-Flush Valves, Electronic & Gas Connectors.

Software/GC Control Interface:

- Enter and store GC Methods via Computer connection
- Safety Limits on all user entered parameters
- Communications: RS232, RS485, Ethernet, Digital I/O
- Protocols: Modbus, TCP
- Sequencing for Sampling, Injection, Backflush, etc.
- Memory Storage - up to 256Gb
- Control for Carrier Gas(s)
- Control for Valves (Injection, Backflush, Sample)
- Universal voltage input (85 – 240 Vac, 50-60Hz)
- Power Supply - (20 – 28 Vdc)
- Power Consumption - 75 Watts maximum

Features:

- 150 °C Temperature Limit with 0.1 °C set-point resolution
- Isothermal Operation
- Repeatability - < 0.05% RSD
- Cycle Time (Typical) - 60 sec
- Detection Limit (500ppb - 100%)
- Sequence Controlled Injection Time
- 1 Micro-machined Injector per Channel
- 1 Pre-Column with Backflush per Channel
- 1 Analytical Column per Channel
- Dimensions: 20 x 15 x 10 cm
- Weight: 10.0kg

Headspace Autosampler:

Features:

- Sampling: 42 Vials 20ml Headspace
- 2X Sample Probes
- Pull Up Strokes: Up to 15 Strokes
- Filling Speed: 0.5 - 100ml/min
- Time between Samples: 0 - 100 mins
- Shaking Method: Orbital
- Incubation Oven: 6 position
- Incubation Time: 0 - 999 mins
- Oven Temperature: 40 - 170C
- Shaker Speed: Very Low to Very High
- Shaking Cycles: 0 - 9.9 mins
- Probe Injection Depth: Variable
- Electrical Control: LAN & TTL
- Dimensions: 330 x 640 x 320mm
- Weight: 10.0kg
- Power Supply: 100-240VAC, 50-60Hz



Headspace Autosampler



Micro-TCD GC System